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STAR

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For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

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Includes passenger and cargo air transport operations; and aircraft accidents.

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07 AIRCRAFT PROPULSION AND POWER 1585

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

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82 DOCUMENTATION AND INFORMATION SCIENCE 1739
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1741
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 1741
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1763
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1765
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 1766
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION N.A.
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 1767

Note: N.A. means that no abstracts were assigned to this category for this issue.

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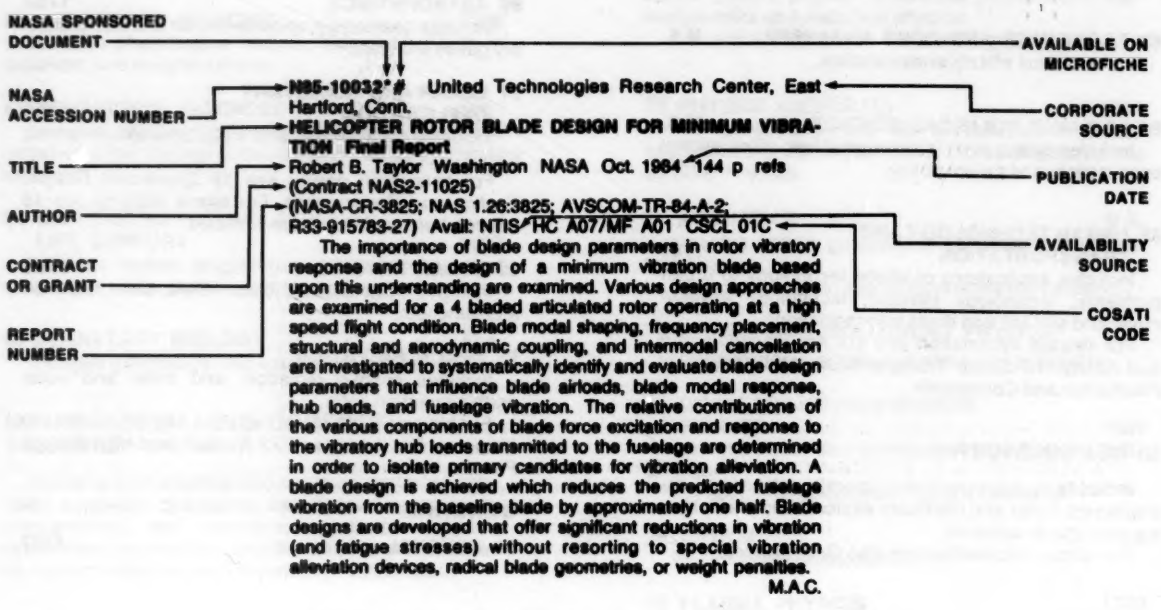
TYPICAL CITATION AND ABSTRACT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COSATI CODE
N85-10032*# United Technologies Research Center, East Hartford, Conn.
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
(Contract NAS2-11025)
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 11 / JUNE 8, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-19921* National Aeronautics and Space Administration, Washington, D. C.
HIGH ROAD TO CHINA
B. Poanics Jan. 1984 115 p
(PR-1) Avail: NTIS HC A06/MF A01 CSCL 01A

This bibliography lists 409 reports, articles and other documents introduced into the NASA scientific and technical information system in December 1983. Author

N85-19922# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA AERONAUTICA ET ASTRONAUTIC SINICA (SELECTED ARTICLES)
C. Liu, H. Gao, and Q. X. Gong 27 Nov. 1984 42 p Transl. into ENGLISH from Hangkong Xuebao (China), v. 5, no. 1, 1984 p 11-29
(AD-A148830; FTD-ID(RS)T-1150-84) Avail: NTIS HC A03/MF A01 CSCL 20/4

An analysis of various vibrational modes affecting the control and performance of fixed wing military combat aircraft was made. Among those topics considered were: (1) the state time spectrum of aircraft ambient vibration; (2) the longitudinal feedback coefficients of a stability augmentation system designed to meet the requirements of riding quality; and (3) aircraft lateral directional limit cycle oscillations induced by aerodynamic hysteresis. Mathematical modeling methods were used to formulate analytical equations and solutions suitable for these applications. G.L.C.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-19923*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE CONSTRAINTS EFFECTING OPTIMAL PROPELLER DESIGNS
Christopher J. Miller and John P. Sullivan 1985 15 p refs To be presented at the Soc. of Automotive Engr. Gen. Aviation Aircraft Meeting and Exposition, Wichita, Kan., 16-19 Apr. 1985
(NASA-TM-86967; E-2449; NAS 1.15:86967) Avail: NTIS HC A02/MF A01 CSCL 01A

A preliminary design tool for advanced propellers was developed combining a fast vortex lattice aerodynamic analysis, a fast subsonic point source noise analysis, and an optimization scheme using a conjugate directions method. Twist, chord and sweep distributions are optimized to simultaneously improve both the aerodynamic performance and the noise observed at a fixed relative position. The optimal noise/performance tradeoffs for straight and advanced concept blades are presented. The techniques used include increasing the blade number, blade sweep, reducing the rotational speed, shifting the spanwise loading and diameter changes. E.A.K.

N85-19924*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENTS IN THE SIMULATION OF COMPRESSIBLE INVISCID AND VISCOUS FLOW ON SUPERCOMPUTERS
Joseph L. Steger and Pieter G. Buning Feb. 1985 28 p refs
(NASA-TM-86674; A85121; NAS 1.15:86674) Avail: NTIS HC A03/MF A01 CSCL 01A

In anticipation of future supercomputers, finite difference codes are rapidly being extended to simulate three-dimensional compressible flow about complex configurations. Some of these developments are reviewed. The importance of computational flow visualization and diagnostic methods to three-dimensional flow simulation is also briefly discussed. R.J.F.

N85-19925*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL INVESTIGATION OF A FULL-SCALE CANARD-CONFIGURED GENERAL AVIATION AIRPLANE
Long P. Yip Mar. 1985 81 p refs
(NASA-TP-2382; L-15744; NAS 1.60:2382) Avail: NTIS HC A05/MF A01 CSCL 01A

An investigation was conducted in the Langley 30- by 60-Foot Tunnel to determine the aerodynamic characteristics of a powered, full-scale model of a general aviation airplane employing a canard. Although primary emphasis of the investigation was placed on evaluating the aerodynamic performance and the stability and control characteristics of the basic configuration, tests were also conducted to study the following effects of varying the basic configuration: effect of Reynolds number; effect of canard; effect of outboard wing leading-edge droop; effect of center-of-gravity location; effect of elevator trim; effect of landing gear; effect of lateral-directional control; effect of power; effect of fixed transition; effect of water spray; effects of canard incidence, canard airfoil section, and canard position; and effects of winglets and upper winglet size. Additional aspects of the study were to determine the boundary-layer transition characteristics of airfoil surfaces and the effect of fixing the boundary layer to be turbulent by means of a transition strip near the leading edge. The tests were conducted at Reynolds numbers from 0.60 x 10 to the 6th power to 2.25x10 to the 6th power, based on the wing mean aerodynamic chord, at angles of attack from -4.5 deg to 41.5 deg, and at angles of sideslip from -15 deg to 15 deg. Author

N85-19926# Direction des Recherches Etudes et Techniques, Paris (France). Div. Dynamiques des Fluides.
MODELING TURBULENT FLOW IN COMPRESSIBLE FLUIDS: METROLOGICAL ASPECTS [MODELISATION DES ECOULEMENTS TURBULENTS EN FLUIDES COMPRESSIBLES - AS-

PECTS METROLOGIQUES]
Oct. 1984 139 p refs In FRENCH Presented at 3rd Groupe de Travail Modelisation des Ecoulements Turbulents en Fluides Compressibles Meeting, Paris, 22 Jun. 1984
Avail: NTIS HC A07/MF A01

Flow measurement techniques including laser Doppler velocimeters, hot-wire flowmeters, Raman spectroscopy, Rayleigh scattering and infrared radiometry are described. Free jets, turbulent boundary layers, and flames are considered. For individual titles, see N85-19927 through N85-19932.

N85-19927# Aix-Marseilles Univ. (France). Inst. de Mecanique Statistique de la Turbulence. in Compressible Fluids: Metrology Aspects Oct. 1984 p 5-26
COMPARISON OF TWO-DIMENSIONAL LASER AND HOT-WIRE VELOCIMETRY FOR A SUPERSONIC TURBULENT BOUNDARY LAYER [COMPARAISON ENTRE VELOCIMETRIE BIDIMENSIONNELLE PAR LASER ET PAR FIL CHAUD DANS LE CAS D'UNE COUCHE LIMITE TURBULENTE A VITESSE SUPERSONIQUE]
M. Elena and J. Gaviglio *In* Direction des Recherches, Etudes et Techniques Modeling Turbulent Flow refs In FRENCH (For primary document see N85-19926 11-02)
Avail: NTIS HC A07/MF A01

Laser velocimeter and hot-wire flowmeter measurements of a turbulent boundary layer at Mach 2.3 were compared in wind tunnel tests. Laser measurements are more repeatable and, in nondimensional form, closer to standard reference values than hot-wire results. Author (ESA)

N85-19928# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CHARACTERIZATION OF JET TURBULENCE USING INFRARED RADIOMETRY [CARACTERISATION DE LA TURBULENCE D'UN JET PAR RADIOMETRIE INFRAROUGE]
G. Fournier *In* Direction des Recherches, Etudes et Techniques Modeling Turbulent Flow in Compressible Fluids: Metrology Aspects Oct. 1984 p 27-39 refs In FRENCH (For primary document see N85-19926 11-02)
Avail: NTIS HC A07/MF A01

The use of temperature measurements obtained by infrared emission spectroscopy to characterize turbulence is discussed. Typical measurement set-ups and results are described. Author (ESA)

N85-19929# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LASER RAMAN TECHNIQUES FOR STUDYING FLOWS AND FLAMES [TECHNIQUES RAMAN D'ETUDES DES ECOULEMENTS ET DES FLAMMES PAR LASER]
Brigitte Attal, Sylvie Druet, Robert Bailly, Michel Pealat, and Jean-Pierre Taran *In* Direction des Recherches, Etudes et Techniques Modeling Turbulent Flow in Compressible Fluids: Metrology Aspects Oct. 1984 p 41-50 refs In FRENCH (For primary document see N85-19926 11-02)
Avail: NTIS HC A07/MF A01

Laser Raman gas diagnostics and coherent anti-Stokes Raman spectroscopy (CARS) utilization in aerodynamics and combustion physics is reviewed. Raman spectroscopy is suited to analysis of mixtures, where with 1 min observation, components with partial pressures from 1 to 10 mbar are detected with spatial resolution of a few millimeters. It is unsuited to flame studies because of interference from background light. Here CARS techniques, with their higher signal intensity, are more adapted, although the equipment required is less robust and more expensive. Author (ESA)

N85-19930# Centre d'Etudes Aerodynamiques et Thermiques, Poitiers (France).
EXPERIMENTAL APPROACH TO TERMS WITHIN GRIDS [APPROCHE EXPERIMENTALE DES TERMES SOUS MAILLE]
M. Bouriot and J. Delville *In* Direction des Recherches, Etudes et Techniques Modeling Turbulent Flow in Compressible Fluids: Metrology Aspects Oct. 1984 p 51-66 refs In FRENCH (For primary document see N85-19926 11-02)
Avail: NTIS HC A07/MF A01

A technique for studying variables in Navier-Stokes equations at scales smaller than that of the computational grid is proposed. It links the various scales and their behavior by experimental models. The velocity field is divided into a large scale component obtained by spatial filtering of the instantaneous flow field, and a within-grid field, which is the difference between the filtered and nonfiltered instantaneous component. An experimental technique based on this approach was constructed. If it proves successful, a network of probes could be replaced by a single probe. Author (ESA)

N85-19931# Institut Franco-Allemand de Recherches, St. Louis (France).
VELOCITY AND VOLUMETRIC MEASUREMENT IN FREE JETS [MESURES DE VITESSE ET DE MASSE VOLUMIQUE DANS LES JETS LIBRES]
L. Bobin, J. Haertig, B. C. Jaeggy, and P. Meyer *In* Direction des Recherches, Etudes et Techniques Modeling Turbulent Flow in Compressible Fluids: Metrology Aspects Oct. 1984 p 67-106 refs In FRENCH (For primary document see N85-19926 11-02)
Avail: NTIS HC A07/MF A01

Laser Doppler velocimeter (LDV) and Raman spectrometer flow measurements in excited free jets are discussed. The LDV results agree well with theory, even if hypotheses are simplified to permit an entirely analytical solution. Given the complexity of its data analysis, LDV requires a high degree of confidence in the raw data and thorough knowledge of instrument performance. A Raman spectroscopy study of entrainment of air by carbon dioxide and nitrogen jets gives promising results, but a data recording failure occurred. Author (ESA)

N85-19932# Ecole Polytechnique, Palaiseau (France).
FOURIER DENSITOMETRY: A NEW OPTICAL METHOD FOR MEASURING DENSITY FLUCTUATIONS BY RAYLEIGH SCATTERING [LA FOURIER-DENSITOMETRIE: UNE NOUVELLE METHODE OPTIQUE DE MESURE DES FLUCTUATIONS DE DENSITE PAR DIFFUSION RAYLEIGH]
D. Gresillon, M. S. Mohamed-Benkadda, J. L. Gerstenmayer, A. Hermon, and C. Baudet *In* Direction des Recherches, Etudes et Techniques Modeling Turbulent Flow in Compressible Fluids: Metrology Aspects Oct. 1984 p 107-138 refs In FRENCH (For primary document see N85-19926 11-02)
Avail: NTIS HC A07/MF A01

A free jet was observed by a method which exploits heterodyne detection of Rayleigh scattering of coherent infrared laser radiation. It is shown that the signal obtained is the instantaneous value of a spatial Fourier transformation of the density of the fluid. Results show that density fluctuations in the jet are anisotropic, and that the oscillations can be recorded numerically according to their wave vector and propagation direction. The Kolmogorov scale law applies very well to the density fluctuations. Results also reveal the emission of sound waves and show how the method could be used for statistical tests of turbulence closure. Author (ESA)

N85-19933# Sandia Labs., Albuquerque, N. Mex. Aerothermodynamics Div.
LOVEL-84: A LOW-VELOCITY AERODYNAMIC HEATING CODE FOR FLAT PLATES, WEDGES, AND CONES
A. L. Thornton May 1984 57 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002604; SAND-84-0457) Avail: NTIS HC A04/MF A01

The LOVEL computer program calculates the cold-wall heat transfer in subsonic and supersonic flow over wedge and conical (sharp and blunt body) geometries for freestream Mach numbers (M/sub infinity/) less than 6.0. Fluid properties used to compute the cold-wall heat-transfer rates are lased on Eckert's reference enthalpy correlation. The theory used in the computation of the cold-wall heat-transfer rates and the input/output format for the LOVEL computer program are described. Program output includes

freestream conditions, boundary-layer edge conditions, cold-wall heat-transfer rates, plots of heating rates, and punched-card output for use in ablation and in-depth transient heat-conduction computer codes. DOE

N85-19934# Institut Franco-Allemand de Recherches, St. Louis (France).
GENERATION OF A PAIR OF SYMMETRIC EDDIES BEHIND A SLENDER AXISYMMETRIC BODY WITH PITCH ANGLE [DIE AUSBILDUNG EINES SYMMETRISCHEN WIRBELPAARES HINTER EINEM ANGESTELLTEN SCH SCHLANKEN DREHKOERPER]
W. Czichowsky 21 Jun. 1984 90 p refs In GERMAN
(ISL-R-121/83) Avail: NTIS HC A05/MF A01

Steady three dimensional flow around a body is approximated to unsteady two dimensional flow around a cylinder with the unsteady slender-body analogy. The flow perpendicular to the cylinder axis is calculated with a discretized nonviscous multivortex model. Circulation of created eddies is defined by circulation generation in boundary layers. Separation lines are deduced from experimental results, and approximated from boundary layer theory. The position of eddies in the wake is determined by numerical integration. The results show the mechanism of vortex sheet coiling and the formation of a pair of symmetric eddies behind a slender axisymmetric body with a pitch angle of 20 deg. The characteristic values of eddy motion are related to pitch angle and travel distances. Author (ESA)

N85-19935# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction de l'Aerodynamique.
EXPERIMENTAL INVESTIGATION OF A BREAKDOWN CRITERION FOR A VORTEX IN AN INCOMPRESSIBLE FLOW Final Report [RECHERCHE EXPERIMENTALE DUN CRITERE DECLATEMENT POUR UN TOURBILLON EN ECOULEMENT INCOMPRESSIBLE]
J. L. Solignac Jul. 1984 50 p refs In FRENCH
(Contract DRET-83.95.003)
(ONERA-RT/27/1147/AY) Avail: NTIS HC A03/MF A01

A breakdown limit curve for delta wing vortices was derived. The parameters involved; vortex intensity and the amplitude of the pressure gradient to which it is subjected were determined experimentally. Although not a precise criterion, the curve defines breakdown in breakdown boundary conditions. Author (ESA)

N85-19936# Centre d'Etudes Aerodynamiques et Thermiques, Poitiers (France).
EXPERIMENTAL INVESTIGATION OF A TURBULENT INCOMPRESSIBLE BOUNDARY LAYER ON A CURVED WALL Final Report [ETUDE EXPERIMENTALE DUNE COUCHE LIMITE TURBULENTE INCOMPRESSIBLE SUR UNE PAROI COURBE]
P. E. Lemonnier (CNRS) Jul. 1984 118 p refs In FRENCH
(Contract DRET-82.169.4)
Avail: NTIS HC A06/MF A01

The effects of a wall with 3% curve on a turbulent two dimensional incompressible boundary layer were studied in a wind tunnel using 400 mm long test sections. In the extreme case, perturbation caused by the introduction of a probe can cause separation. The curve considerably increases variations in wall pressure and friction, compared with flat walls. Local differences can attain 50% between the two cases. Although the velocity profiles of flat and curved cases are initially similar, curvature increases Reynolds stress by 15% to 30%. After 150 mm flow, the curve increases boundary layer thickness, average velocity profiles, and Reynolds stress by up to 300%. Author (ESA)

N85-19937# European Space Agency, Paris (France).
FLIGHT MECHANICS ANALYSIS OF DYNAMIC DERIVATIVES OF THE DORNIER VARIABLE WIND TUNNEL MODEL
Dietrich Altenkirch Oct. 1984 124 p refs Transl. into ENGLISH of "Flugmech. Anal. der dyn. Derivative des Dornier-Variationsmodells', DFVLR, Brunswick Rept. DFVLR-FB-83-38, Nov. 1983 Original language document previously announced as N84-24541 (ESA-TT-854; DFVLR-FB-83-38) Avail: NTIS HC A06/MF A01; original German version available from DFVLR, Cologne 38

Wind-tunnel measurements with a fighter aircraft model on a dynamic balance are discussed. The principal fuselage with closed engine inlets was combined with swept back wing, rhombic wing and delta wing and additional horizontal and vertical stabilizer modifications. A strake could be added. The influence of wing shape, stabilizer configuration and strake on the dynamic derivatives of the longitudinal and lateral motion were measured and compared with theoretical computations. Comparison shows that existing theoretical methods can not describe physical phenomena which occur at higher angles of attack. Author (ESA)

N85-20191# Joint Publications Research Service, Arlington, Va.
A FAST ALGORITHM OF THE FINITE DIFFERENCE METHOD FOR COMPUTATION OF THE TRANSONIC FLOW PAST AN ARBITRARY AIRFOIL WITH THE CONSERVATIVE FULL-POTENTIAL EQUATION Abstract Only
Mingke Huang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 22 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 19-24 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

N85-20194# Joint Publications Research Service, Arlington, Va.
A STUDY FOR CALCULATING ROTOR LOADS USING FREE VORTEX CONCEPT Abstract Only
Tianen Ruan, Qingrui Han, Ruiguang Li, and Xinkang Shen *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 25 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 50-60 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

N85-20195# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER TO BLUFF CYLINDERS AND CONES IN HYPERSONIC RAREFIED GAS FLOW Abstract Only
Wei Hua *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1985 p 26 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 61-65 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

N85-20212# Joint Publications Research Service, Arlington, Va.
A LOCALLY LINEARIZED PANEL METHOD FOR TRAN-/SUBSONIC FLOW PAST AN OSCILLATING WING Abstract Only
Binggang Tong, Lixian Zhuang, and Xianlin Li *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 129 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 20-27 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20213# Joint Publications Research Service, Arlington, Va.
TRANSONIC PRESSURE DISTRIBUTION COMPUTATIONS OF A FLEXIBLE WING Abstract Only
Keyang Shen and Xihua Zhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 130 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 28-33 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20214# Joint Publications Research Service, Arlington, Va.
ON RELAXATION OF TRANSONIC FLOWS AROUND ZERO-LIFT AIRFOILS AND CONVERGENCE OF SELF-CORRECTING WING TUNNELS Abstract Only
Xueding Liu and Shijun Luo *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 131 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 34-41 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20215# Joint Publications Research Service, Arlington, Va.
ON DETACHED SHOCK WAVE OF SPHERE MOVING WITH TRANSONIC VELOCITIES Abstract Only
Zhichu Zheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 133 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 98-103 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20216# Joint Publications Research Service, Arlington, Va.
FINITE DIFFERENCE COMPUTATION OF THE FLOW AROUND AIRFOILS IN TWO-DIMENSIONAL TRANSONIC SLOTTED WALL WIND TUNNEL Abstract Only
Naiping Zhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 134 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 104-109 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20792# Joint Publications Research Service, Arlington, Va.
PARACHUTE INFLATION DYNAMICS Abstract Only
S. M. Belotserovskiy, I. V. Dneprov, A. T. Ponomarev, and O. V. Rysev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhanika Tverdogo Tela (Moscow), no. 3, May-Jun. 1984 p 174-179 Original language document was announced as A84-47390 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20795# Joint Publications Research Service, Arlington, Va.
FREQUENCY SPECTRA OF TURBULENT PULSATIONS IN STABILITY OF LAMINAR BOUNDARY LAYER Abstract Only
A. M. Grabovskiy and S. V. Surkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 6 Transl. into ENGLISH from Inzhenerno-Fizicheskiy Zh. (USSR), v. 46, no. 6, Jun. 1984 p 900-904 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-19938# PEER Consultants, Inc., Rockville, Md.
WILDLIFE HAZARDS TO AIRCRAFT CONFERENCE AND TRAINING WORKSHOP: PROCEEDINGS
Michael J. Harrison, ed., Sidney A. Gauthreaux, Jr., ed., and Lilia A. Abron-Robinson, ed. Washington FAA May 1984 363 p refs In ENGLISH; partly in FRENCH Conf. held in Charleston, S.C., 22-25 May 1984
(Contract DTFA01-83-R-11287)
(AD-A148330; FAA/AAS/84-1) Avail: NTIS HC A16/MF A01 CSCL 01/2

A wide range of views on how to control wildlife, particularly birds, which create safety hazards are presented. Information is provided on wildlife hazards in both the United States and internationally. Bird strike statistics, airworhtiness of aircraft and engines, identification and tracking of birds, wildlife control techniques, landscaping and airport site selection considerations, compatible land use, solid waste site bird hazards, and case studies in wildlife control are presented. For individual titles, see N85-19939 through N85-19977.

N85-19939# Thurlow and Associates Environmental Control Consultants Ltd., Ottawa (Ontario).
BIRDS AND AVIATION
V. E. F. Solman *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 1-7 refs (For primary document see N85-19938 11-03)
(AD-P004177) Avail: NTIS HC A16/MF A01 CSCL 01/3

Bird collisions have caused serious damage to aircraft and loss of human life. Turbine engines are more easily damaged than piston engines. The extent of damage in a collision increases rapidly as speed increases. Environmental management helps reduce the attractions of airports to birds. Bird movement can be studied by radar and periods of birds in the air can be avoided or minimized. B.G.

N85-19940# Federal Aviation Administration, Washington, D.C. Office of Airport Standards.
AVOIDING SERIOUS BIRD STRIKE INCIDENTS
Michael J. Harrison *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 9-12 (For primary document see N85-19938 11-03)
(AD-P004178) Avail: NTIS HC A16/MF A01 CSCL 01/3

Bird hazards to aircraft can create serious inflight emergency conditions if the pilot and crew are not prepared to handle the situation. Aspects of bird strike hazards are examined. A bird-hazard checklist is also included. B.G.

N85-19941# Naval Facilities Engineering Command, Philadelphia, Pa. Applied Biology Program.
DON'T FOWL OUT
Harvey A. Shultz *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 13-23 (For primary document see N85-19938 11-03)
(AD-P004179) Avail: NTIS HC A16/MF A01 CSCL 01/3

Bird strike hazard reports prepared after collisions between birds and Naval aircraft indicate that there are many measures available to pilots which can reduce the risk of future collisions. These include: scheduling flights around peaks of bird activity, avoiding bird habitats, restricting speed at low altitudes, lookout vigilence, visor discipline, aircraft to aircraft and aircraft to control tower communication, preflight briefings, bird strike avoidance training, development of a Bird Aircraft Strike Reduction Plan for each air facility, and good reporting. Author

N85-19942# Civil Aviation Authority, Redhill (England). Safety Data and Analysis Unit.
ACCIDENTS AND SERIOUS INCIDENTS TO CIVIL AIRCRAFT DUE TO BIRSTRIKES
John Thorpe *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 25-35 (For primary document see N85-19938 11-03)
(AD-P004180) Avail: NTIS HC A16/MF A01 CSCL 01/3

Histories of accidents and serious incidents such as double engine ingestion, and holed airframes, for the years 1981 to 1983 are detailed. A summary of all fatal accidents due to bird strikes between 1912 and 1980 is attached. Three groups are included: (1) transport airplanes over 5700 kg (12,500 lb) and executive jets; (2) airplane below 5700 kg; and (3) helicopters. No attempt was made to analyze the information although it is apparent for transport aircraft the critical area is engines and for light aircraft and helicopters the windshield may be critical. B.G.

N85-19943# Civil Aviation Authority, Redhill (England). Safety Data and Analysis Unit.
ANALYSIS OF BIRD STRIKES REPORTED BY EUROPEAN AIRLINES, 1976 - 1980
John Thorpe *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 37-48 (For primary document see N85-19938 11-03)
(AD-P004181) Avail: NTIS HC A16/MF A01 CSCL 01/3

Birdstrikes reported world-wide between 1976 and 1980 by European airlines from 14 countries were analyzed. The analysis of over 7500 strikes includes the annual strike rate for each country, for aircraft types and airports, all based on aircraft movements. It also covers bird species and weights, part of aircraft struck, effect of strike, and cost. Gulls were involved in over 40% of the incidents where the type of bird was known, and that only 1% of bird strikes involves birds of over 4 lbs. The major effects were damage to over 330 engines and the loss of a Boeing 737 aircraft (value

$4.5 million). Engineering costs are estimated to be about 16 million US dollars excluding the Boeing 737. Author

N85-19944# Air Force Engineering and Services Center, Tyndall AFB, Fla.

1983 AIR FORCE BIRD STRIKES

Robert C. Kull, Jr. *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 49-58 (For primary document see N85-19938 11-03)

(AD-P004182) Avail: NTIS HC A16/MF A01 CSCL 01/3

Since 1975, the Air Force Bird/Aircraft Strike Hazard (BASH) Team, located at Tyndall AFB FL, was responsible for maintaining all Air Force bird/aircraft strike data. Information for 1983 was compiled and trends determined in order to better define the extent of the bird/aircraft strike hazard potential. During the 1983 reporting period, there were over 2300 reported bird strikes costing more than $4 million. In addition, one major and several minor personnel injuries resulted from windshield/canopy penetrations by birds. Trends in the Air Forces' bird strike occurrences are identified and the continual need for reporting all bird strikes are emphasized. Author

N85-19945# German Board for Birdstrike Prevention, Traben-Trarbach (West Germany).

WORLDWIDE BIRDSTRIKE STATISTICS OF LUFTHANSA GERMAN AIRLINES

Jochen Hild *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 59-70 refs (For primary document see N85-19938 11-03)

(AD-P004183) Avail: NTIS HC A16/MF A01 CSCL 01/3

Lufthansa German Airlines register an average number of 328 birdstrikes yearly. The costs of repairs, disregarding subsequent costs due to flight plan changes or cancellations, amount to 1 Mio DM yearly. According to a preliminary estimate damage costs are increasing strongly at the moment. During 1983 the costs amounted to nearly 6.0 Mio DM. Author

N85-19946# Thurlow and Associates Environmental Control Consultants Ltd., Ottawa (Ontario).

BIRDS AND AIRCRAFT ENGINE STRIKE RATES

V. E. F. Solman *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 71-76 refs (For primary document see N85-19938 11-03)

(AD-P004184) Avail: NTIS HC A16/MF A01 CSCL 01/3

A recent Canadian study involving the years 1977 to 1982 inclusive relates engine bird strike rates to different aircraft types and to different engine locations on similar-sized aircraft. Incidents of engine damage, including simultaneous multi-engine strikes are related to aircraft types and engine locations. The data presented suggest high vulnerability to bird strikes, bird ingestion and related damage in the case of large, quiet, underwing-mounted engines. Much lower strike, ingestion and damage rates are suggested for small, noisy, rear-mounted engines. Where the same engines are used in both locations the strike rates are more than four times greater in the underwing location. Author

N85-19947# Federal Aviation Administration, Washington, D.C. Office of Airport Standards.

REVIEW OF ENGINE INGESTIONS TO WIDE BODY TRANSPORT AIRCRAFT

Michael J. Harrison *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 77-84 (For primary document see N85-19938 11-03)

(AD-P004185) Avail: NTIS HC A16/MF A01 CSCL 01/3

In January 1981, the Federal Aviation Administration's (FAA) Northwest Region raised the issue of dual engine ingestion hazards to large, high bypass turbofan twin engine powered transport aircraft. The issue was whether dual engine failure was likely due to bird ingestions on twin engine aircraft equipped with high bypass turbofan engines. The Northwest Region, whose responsibility is certification of transport category aircraft, initiated a survey through air carriers worldwide, identifying damaging engine ingestions. The FAA's New England Region, who has responsibility for engine certification, initiated a reveiw of engine ingestion data. In April 1981, an ad hoc team was formed to collect and analyze ingestion data. Some of the data are presented and some considerations offered on how bird strike data should be collected and analyzed. Author

N85-19948# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.

AIRCRAFT TRANSPARENCY BIRD IMPACT ANALYSIS USING THE MAGNA COMPUTER PROGRAM

R. E. McCarty *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 85-94 refs (For primary document see N85-19938 11-03)

(AD-P004186) Avail: NTIS HC A16/MF A01 CSCL 01/3

The development of a finite element computer program called MAGNA is discussed and experience with the application of this code to the bird impact analysis of a tactical aircraft canopy is related. Results are presented which show MAGNA to be capable of realistically simulating the canopy response to bird impact. The strong dependence of the bird impact loading upon the dynamic response of the canopy is pointed out, and the need to develop the capability to independently account for the effects of this load-response coupling is stated. The MAGNA computer program is technically capable of realistically simulating nonlinear dynamic structural response of aircraft transparencies to bird impact loading. It is not yet possible to accurately define a priori the loads resulting from bird impact on very flexible aircraft transparencies. This is true because the magnitude of the loads as well as the surface area and period of time over which they act depend strongly on the dynamic response of the transparency. R.J.F.

N85-19949# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

BIRD IMPACT EVALUATION OF THE F/RF-4 TRANSPARENCY SYSTEM

Robert Simmons and G. J. Stenger (Dayton Univ., Ohio) *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 95-105 refs Previously announced as N84-26631 (For primary document see N85-19938 11-03)

Avail: NTIS HC A16/MF A01 CSCL 01/3

Birdstrikes to the crew enclosures of USAF F/RF-4 aircraft resulted in major aircraft damages coupled with severe fatal pilot injuries. Analysis of operational bird impact statistical data indicates that the trend of damaging bird impacts of the F-4 is continuing to rise. Impacts to the F-4 transparency system also continue to rise resulting in a continued flight safety risk to the aircraft and the aircrew. A program was started to develop a transparency system for the F-4 aircraft which has four pound, 500 knot bird impact capability. The first step in this program was to experimentally determine the existing transparency system capability by bird impact testing full scale flight hardware. Right impact locations on the windshield and forward canopy were tested to failure with four pound birds. Tests on experimental, laminated windshield side panels were also conducted to investigate the capability of the windshield frame. The baseline birdstrike test results are presented through the use of post test photographs and an impact capability diagram. R.J.F.

N85-19950# Amsterdam Univ. (Netherlands). Inst. for Taxonomic Zoology.

MICROSCOPIC IDENTIFICATION OF FEATHERS IN ORDER TO IMPROVE BIRDSTRIKE STATISTICS

T. G. Brom *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 107-119 refs (For primary document see N85-19938 11-03)

(AD-P004187) Avail: NTIS HC A16/MF A01 CSCL 01/3

In the period 1960-1983, 1132 bird remains resulting from collisions with aircraft were sent to the Zoological Museum Amsterdam. Before 1978, these remains were identified macroscopically by comparing them with feathers from bird skins. During this period the results strongly depended on the skill of the examiner and on the condition of the feather remains. On average, 26, mostly large remains, were sent annually to the museum, of which

80% could be recognized. The remains received represented roughly 30% of the total number of reported birdstrikes. Thus birdstrike statistics could be easily biased by over-representation of nearly complete bird corpses. In order to improve the existing identification method, a microscopic key to the determination of feather remains was developed, and used in combination with macroscopic methods from 1978 on. From 1976, airfield personnel were convinced of the importance of collecting even the smallest bird remains in and on aircraft. Consequently, the total number of remains sent to the museum strongly increased to some 110 per year. Identification results from 1960-1977 are compared with those from 1978-1983, and the effect of the introduction of the microscopic key on birdstrike statistics is discussed. Author

N85-19951# Clemson Univ., S.C. Dept. of Biological Sciences.
THE USE OF SMALL MOBILE RADARS TO DETECT, MONITOR, AND QUANTIFY BIRD MOVEMENTS
Sidney A. Gauthreaux, Jr. *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 121-132 refs (For primary document see N85-19938 11-03)
(AD-P004188) Avail: NTIS HC A16/MF A01 CSCL 01/3

A mobile research laboratory that was developed for the Electric Power Research Institute (EPRI) to monitor local and migratory movements of birds near transmission lines during the day and at night is described. The mobile laboratory has two small marine radars: a fixed-beam type that can be directed vertically to measure the altitude of migrating birds and a surveillance type that can be used to examine the geographical patterns of movement within a range of a few kilometers. The laboratory is also equipped with an image intensifier for visual studies of bird movements at night. A closed circuit television system and a video cassette recorder are used to record information from the fixed-beam radar and the image intensifier. A 16-mm movie camera with an electronic shutter control is used to record the display of the surveillance radar. Although the mobile laboratory was designed to study bird movements in the vicinity of transmission lines, it can also be used to gather valuable information on the patterns of bird movements in the vicinity of airports that have potential bird strike problems. R.J.F.

N85-19952# Royal Netherlands Air Force, The Hague. Flight Safety Div.
ON THE ALTITUDINAL DISTRIBUTION OF BIRDS AND BIRD STRIKES IN THE NETHERLANDS
Luit S. Buurma *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 133-148 refs (For primary document see N85-19938 11-03)
(AD-P004189) Avail: NTIS HC A16/MF A01 CSCL 01/3

Bird strikes, radar observations and visual counts are discussed and used to reconstruct altitudinal distributions of bird movements over the Netherlands. Bird density curves, particularly for the lowest 1000 ft., are urgently needed with respect to solving the problem of a recent rapid increase of bird strike rates due to the intensification of low level training by fighter aircraft. The long range surveillance radars, presently in use to provide data for bird migration warning systems in several West European countries, fail to cover the lowest air layers. This gap may be filled up by field observers and/or small radars. Parallel to visual observations and time lapse film recordings at the long range surveillance radar in NW Holland, a series of altitude measurements was collected. This preliminary study with a tracking radar of the type Flycatcher provided the data to illustrate the problem and its possible solutions. R.J.F.

N85-19953# Fish and Wildlife Service, Sandusky, Ohio.
BLACKBIRDS AND STARLINGS: POPULATION ECOLOGY AND HABITS RELATED TO AIRPORT ENVIRONMENTS
Richard A. Dolbeer *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 149-160 refs (For primary document see N85-19938 11-03)
(AD-P004190) Avail: NTIS HC A16/MF A01 CSCL 01/3

The Red-winged Blackbird (Agelaius phoeniceus) is the most abundant bird in North America today. It is often joined in roosting assemblages by Common Grackles (Quiscalus quiscula), Brown-headed Cowbirds (Molothrus ater), and Starlings (Sturnus vulgaris). The combined populations of these 4 species exceed 500 million birds during the winter roosting season and increase to over 1 billion birds after the young are fledged in summer. In spite of their abundance, they are involved in only about 6% of the bird strikes to aircraft, less than 1/7 the number of strikes caused by the less abundant gulls (Larus spp.). However, the rather infrequent collisions between aircraft and blackbirds or Starlings can be catastrophic, even though these species have less than 10% the weight of most gull species. Because blackbirds and Starlings are prolific and well adapted to modern land-use practices, attempts to eradicate populations at airports through killing will provide only temporary relief. The key to reducing blackbird and Starling activity in the vicinity of airports lies in the elimination of preferred roost sites through habitat modifications and in the reduction of food supplies through changes in agriculture. Author

N85-19954# Air Force Engineering and Services Center, Tyndall AFB, Fla.
CATTLE EGRET HAZARD ASSESSMENT
Timothy J. Will *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 161-170 refs (For primary document see N85-19938 11-03)
(AD-P004191) Avail: NTIS HC A16/MF A01 CSCL 01/3

Cattle Egrets (Bubulcus ibis) became established in the U.S. as a well-known species since their immigration from South America in the early 1950's. They showed themselves to be well-adapted to new environments, and expanded into most parts of North America. The Air Force recorded several bird/aircraft strikes with Cattle Egrets, resulting in thousands of dollars in damage and aircraft down time. Behaviorial aspects of the birds such as reproduction and feeding, combined with large populations, make Cattle Egrets a particularly bad problem in some areas. One particular Air Force location required extensive measures be taken in order to eliminate a roost site adjacent to an active airfield runway. In order to give insight into dealing effectively with Cattle Egrets near airports, their feeding, reproduction, and nesting habits are explained. Author

N85-19955# Service Technique de la Navigation Aerienne, Aix-en-Provence (France).
BIRDS ON AIRPORTS: THE REASON FOR THEIR PRESENCE
Marc Laty *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 171-174 (For primary document see N85-19938 11-03)
Avail: NTIS HC A16/MF A01 CSCL 01/3

The factors that make airports attractive to birds are discussed. Food sources, shelter, relative peace, and meteorological conditions are discussed. R.J.F.

N85-19956# Service Technique de la Navigation Aerienne, Aix-en-Provence (France).
THE USE OF FALCONRY AS MEAN TO PERSUADE THE BIRDS TO STAY OUT OF THE AIRPORT VICINITY
Marc Laty *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 175-182 In FRENCH (For primary document see N85-19938 11-03)
Avail: NTIS HC A16/MF A01 CSCL 01/3

Results obtained using the goshawk (Accipiter gentilis) against the herring gulls (Larus argentatus) at the Istre le Tube Airport and the peregrine falcon (Falco pergrinus) against the lapwing at the Toulouse-Blagnac Airport show that falconry can be used with success as a method of discussion around an airport. This is possible on condition that its application takes into account the particular case of the airport considered and the type of undesirable bird. Transl. by A.R.H.

N85-19957# Thurlow and Associates Environmental Control Consultants Ltd., Ottawa (Ontario).
CONTROL OF MAMMALS AT AIRPORTS
N. S. Novakowski *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 183-186 refs

(For primary document see N85-19938 11-03)
(AD-P004192) Avail: NTIS HC A16/MF A01 CSCL 01/3

Airport designers and planners, when considering the natural environment within and around the airport, have two options. Those options are: to create as sterile an environment as possible thereby excluding fauna, or to create an aesthetically pleasing environment. Design considerations can be devised to include landscaping models which exclude some mammals and meet aesthetic requirements. Technological means to eliminate or repel mammals from airports such as trapping, chemical repellents, removal of attractants, aversive conditioning, and mechanical or electronic scaring devices are now available and their relative value is reviewed. If the above-mentioned technology is employed, ad hoc measures such as human intervention (patrols) may be considered. This method tends to be costly in terms of man-power and time and is somewhat unreliable as well. The problem of control of mammals exists in many airports, particularly in more isolated areas or in the environs of high productivity wildlife areas. It is a problem which cannot be ignored and whose solution would benefit both human and wildlife interests. R.J.F.

N85-19958# Advanced Farm Systems, Inc., Hawthorne, Fla.
DEER CONTROL USING 7 STRAND VERTICAL FENCE
Darel Smith and Dick Kearley *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 187-188 (For primary document see N85-19938 11-03)
Avail: NTIS HC A16/MF A01 CSCL 01/3

The design and construction of a seven strand vertical fence for deer control is discussed. A low impedance type energizer is used to make the fence effective. These energizers have high voltage and high wattage and can carry many miles of wire with considerable weed loads and still stay effective. Energizers of the highest possible wattage should always be used regardless of fence size to insure a strong shock. The Bi-polar energizer puts out both positive and negative electricity on alternating wires. The 1st wire in the fence is at ground level and is attached to the energizer ground field and to additional ground rods driven every 2500 feet along the fence line. When a deer touches any wire, either positive or negative, and conditions are such that earth return is working, the deer will be repelled. The same thing is accomplished with a standard energizer by alternating a hot wire and ground wire. E.A.K.

N85-19959# Thurlow and Associates Environmental Control Consultants Ltd., Ottawa (Ontario).
AIRPORT SITE SELECTION AND DESIGN c09
William J. Thurlow *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 189-194 refs (For primary document see N85-19938 11-03)
(AD-P004193) Avail: NTIS HC A16/MF A01 CSCL 01/5

Airport site selection involves a compromise of many physical factors, and biological and physical factors that affect the wildlife use of an area. After site selection, the design of the airport including its drainage system, its buildings, and its ground cover is carried out in such a way that it minimizes the attraction to birds, and other animal species. Agriculture on land on the airport and on adjacent land is almost as attractive to birds as areas for food wastes disposals and sewage treatment products. It is concluded that almost any animal species can be a problem at airports; control techniques are available to eliminate or reduce these problems; and research is continuing to improve the ability to address hazards to aircraft caused by aircraft collision with birds and mammals. E.A.K.

N85-19960# German Board for Birdstrike Prevention, Traben-Trarbach (West Germany).
LANDSCAPE MANAGEMENT ON AIRPORTS FOR REDUCTION OF BIRD POPULATIONS c09
Jochen Hild *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 195-206 refs (For primary document see N85-19938 11-03)
(AD-P004194) Avail: NTIS HC A16/MF A01 CSCL 01/5

With the aid of landscape management the number of bird-strikes on German military airfields and civil airports was reduced. Measures taken are: (1) agricultural use and pasturing near airports is forbidden; (2) on grassland areas special methods of grass mowing are practiced; like long-grass procedure and/or use of growth inhibitors; (3) large areas were afforested with small woods with a high density; (4) heather and swamp areas were promoted and large birds took the place of small size birds. In the airport surroundings it was necessary to eliminate all areas which are attractive to birds, especially considering artificial lakes. Detailed provisions and landscape management is carried out to minimize bird-strike risk during approach and climbing. E.A.K.

N85-19961# Leadville Airport, Inc., Colo.
INEXPENSIVE MULTIPURPOSE LANDSCAPING c09
Ursula Gilgulin *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 207-208 (For primary document see N85-19938 11-03)
Avail: NTIS HC A16/MF A01 CSCL 01/5

High altitude, small budget, limited staff and severe weather makes landscaping difficult. In Leadville, Colorado at Lake County Airport, elevation of 9,927 feet, 20 years after construction the fixed based operation, ramp and terminal areas looked like a forgotten incomplete construction site. The growing season is short and few things grow at all. The value of landscaping to enhance the environment is emphasized. By creating beds of rocks bordered with discarded railroad ties, various flotsam and jetsam from the forests and local mining dumps, visual impact is strong and the results attractive, durable and multipurpose. E.A.K.

N85-19962# Thurlow and Associates Environmental Control Consultants Ltd., Ottawa (Ontario).
REDUCING GULL USE OF SOME ATTRACTIONS NEAR AIRPORTS c09
Victor E. F. Solman *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 209-212 refs (For primary document see N85-19938 11-03)
(AD-P004195) Avail: NTIS HC A16/MF A01 CSCL 01/5

Gulls may visit airports to utilize the open space for loafing or other activities. They are more likely to do so if there are attractive feeding areas nearby. One of the more important food attractions are the areas in which large volumes of edible refuse are exposed. If gulls can be prevented from feeding in such areas they are much less likely to loaf on neighboring areas. The efficiency of widely spaced suspended, very fine wires and fine nylon monofilaments was demonstrated in discouraging gull feeding in areas over which the wires are stretched. The technique does not impose an easily visible physical barrier. The few birds that penetrate under the fine wire, when disturbed, appear to have no difficulty flying up and out through the wires. That is in contrast to the more than 80% of birds that will not penetrate the wired area from above to get at the food. It is suggested that the wires constitute psychological deterrent to landing, perhaps related to flight approach patterns and gull vision. E.A.K.

N85-19963# Federal Aviation Administration, Washington, D.C.
FAA POLICY REGARDING SOLID WASTE DISPOSAL FACILITIES c09
Michael J. Harrison *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 213-218 (For primary document see N85-19938 11-03)
(AD-P004196) Avail: NTIS HC A16/MF A01 CSCL 01/5

The Federal Aviation Administration's (FAA) policy regarding solid waste disposal facilities on the near airports is based on bird strike data, accident information and aircraft performance. Distance criteria used in FAA Order 5200.5, FAA guidance concerning sanitary landfills on or near airports, coincides with distances specified in Federal Aviation Regulation (FaR) Part 77, Objects affecting navigable Airspace. Part 77 provides obstruction standards for use in several FAA safety programs designed to provide aircraft with proper clearance from objects. E.A.K.

N85-19964# PEER Consultants, Inc., Rockville, Md.
AIRPORT BIRD HAZARDS ASSOCIATED WITH SOLID WASTE

DISPOSAL FACILITIES c09

David W. Lake *In its* Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 219-230 refs (For primary document see N85-19938 11-03)

(AD-P004197) Avail: NTIS HC A16/MF A01 CSCL 01/5

All types of refuse disposal facilities that handle putrescible wastes have the potential to attack birds. When solid waste disposal facilities are located in the vicinity of airports, the probability of bird strikes is increased. Solid waste disposal facilities located in the vicinity of a airport may be incompatible with safe flight operations. The Federal Aviation Administration (FAA) and the Environmental Protection Agency (EPA) developed guidelines to identify and eliminate airport bird hazards associated with solid waste disposal facilities. The FAA Order 5200.5 is directed towards airport owners and managers to promote safe airport operations. The EPA criteria are directed towards the State agencies responsible for ensuring that solid waste disposal facilities are operated according to public health and safety standards. Commitment by both of these target groups to encourage and enforce compliance with the guidelines is required to successfully reduce airport bird hazards associated with solid waste disposal facilities. The bird hazard due to solid waste disposal facilities is reviewed and the Federal guidelines and programs to promote proper land use near airports with respect to these facilities are discussed.

E.A.K.

N85-19965# University of Northern Illinois, De Kalb. Dept. of Biological Sciences.

SUCCESSFUL CONTROL OF GULLS AND OTHER BIRDS AT A SANITARY LANDFILL c45

William E. Southern and Linda K. Southern *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 231-240 (For primary document see N85-19938 11-03)

(AD-P004198) Avail: NTIS HC A16/MF A01 CSCL 13/2

Data were collected on the presence of Ring-billed Gulls, Herring Gulls, Turkey Vultures, American Crows and European Starlings at a Maryland landfill. Control procedures involving pyrotechnics were implemented. The effectiveness of control procedures on the various species is discussed. It is demonstrated that gulls and other species can be prevented from concentrating at a landfill.

E.A.K.

N85-19966# LGL Ltd., Toronto (Ontario).

EFFECTIVENESS OF AN OVERHEAD WIRE BARRIER IN DETERRING GULLS FROM FEEDING AT A SANITARY LANDFILL c45

Margaret A. McLaren, Ross E. Harris, and W. John Richardson *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 241-252 refs (For primary document see N85-19938 11-03)

(AD-P004199) Avail: NTIS HC A16/MF A01 CSCL 13/1

The effectiveness of fine parallel overhead wires in deterring herring and ring-billed gulls from landing at an active sanitary landfill was assessed. The study design consisted of alternating periods with and without wires over the active portion of the test landfill, and control observations at two other landfills. Overhead wires at 12 m spacing deterred most herring gulls from feeding. Ring-billed gulls were largely deterred by wire at 12 m spacing when limited garbage was present, but penetrated wires at 12 m spacing when attracted by large amounts of garbage. Wires at 6 m spacing deterred most ring-billed gulls in late spring even with large amounts of garbage present. In summer, when peak numbers of gulls visit landfill sites in the area, numbers of feeding ring-billed gulls were substantially reduced by wires 6 m apart.

E.A.K.

N85-19967# Citadel Coll., Charleston, S.C. Dept. of Biology.

EFFECTIVENESS OF AN OVERHEAD WIRE BARRIER SYSTEM IN REDUCING GULL USE AT THE BFI JEDBURG SANITARY LANDFILL, BERKELEY AND DORCHESTER COUNTIES, SOUTH CAROLINA c45

Dennis M. Forsythe and Tim W. Austin *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 253-264 refs (For primary document see N85-19938 11-03)

(AD-P004200) Avail: NTIS HC A16/MF A01 CSCL 13/2

Sanitary landfills were studied to determine the bird species that actively fed at the landfill and to measure the effected and overhead wire barrier system on bird populations and behavior. The main species were Ring-billed Gulls, Fish Crows and Common Crows. The wire system reduced the mean number of gulls and crow by as much as two-thirds, but did not effect the hour to hour variation in gull and crow numbers. The wire system also reduced the number of gulls and crows soaring over the BFI landfill when compared with the Dorchester Country-SCA landfill. It is shown that a wire barrier system effectively reduced the numbers of gulls and especially crows feeding and loafing at Jedburg.

E.A.K.

N85-19968# Canadian Wildlife Service, Ottawa (Ontario).

EVALUATION OF EFFECTIVENESS OF BIRD SCARING OPERATIONS AT A SANITARY LANDFILL SITE NEAR CFB TRENTON, ONTARIO, CANADA c45

Chris Risley and Hans Blokpoel *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 265-274 refs (For primary document see N85-19938 11-03)

(AD-P004201) Avail: NTIS HC A16/MF A01 CSCL 13/2

Birds are a world-wide hazard at airports due to the potential for strikes with aircraft or their ingestion into engines. Bird hazards can be particularly troublesome at airports located near sanitary landfill sites (SLSs) or other areas where birds may congregate. Daily bird-scaring operations were undertaken at Quinte sanitary landfill site to help reduce gull numbers at nearby CFB Trenton. Independent bird observations were made each week during that same period both at Quinte SLS and at two control SLSs where no bird-scaring operations took place. The effectiveness of individual visits to Quinte SLS by the bird-scaring personnel was usually of short duration. The long-term, cumulative effect of the persistent harassment of the gulls was a large drop in gull numbers, despite the fact that individual bird-scaring visits had only limited success.

R.S.F.

N85-19969# Portland International Airport, Oreg.

DEVELOPMENT OF BIRD HAZARD REDUCTION FOR AIRPORT OPERATIONAL SAFETY c09

Kaye Reznick *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 275-286 refs (For primary document see N85-19938 11-03)

(AD-P004202) Avail: NTIS HC A16/MF A01 CSCL 01/5

Portland International Airport established its bird hazard reduction program in November 1978. At that time, bird control was a fairly new area to public airports in the U.S. PIA was recognized by the FAA as having one of the worst bird strike hazard problems in the county by strike reports that they received and by aircraft damage reported. The bird hazard reduction program is considered to be an integral part of safety responsibility that has developed with airport operation at Portland over the past five years. The ways that solving the bird problem integrated into the airport's operation, the sources that were relied upon for technical assistance and cooperation, and those elements of the program most valuable to its success are outlined from an airport operator's point of view.

R.S.F.

N85-19970# Directorate of Civil Aviation, Copenhagen (Denmark).

THE BIRD STRIKE SITUATION AND ITS ECOLOGICAL BACKGROUND IN THE COPENHAGEN AIRPORT, KASTRUP

In PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 287-290 (For primary document see N85-19938 11-03)

(AD-P004203) Avail: NTIS HC A16/MF A01 CSCL 01/3

The measures taken at Copenhagen Airport to reduce the bird strike problem during the last 20 years are described. Apart from shooting and otherwise scaring away the birds, the ecological countermeasures are presented. They include a change of the agricultural areas of the airport into grass fields with the grass cut to a length of about 20 cm, a close down of a large dump west

of the airport, and measures against a very large breeding colony on the island of Saltholm. The measures at the island include spraying of the nests in the colony with an emulsion of oil and water with the result that the colony production of young birds has diminished. Further, it includes killing of the birds. The use of long grass has caused an increase in mice and as a result hereof an increase in kestrels involved in bird strikes. R.S.F.

N85-19971# Greater Orlando Aviation Authority, Fla.
BIRD CONTROL PROGRAM ORLANDO INTERNATIONAL AIRPORT
Efren T. Gonzalez *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 291-300 (For primary document see N85-19938 11-03)
(AD-P004204) Avail: NTIS HC A16/MF A01 CSCL 01/3

Orlando International Airport's bird problem is explained along with a solution to that problem from an airport operations viewpoint. It should be of interest to airport operators with a bird problem who are considering formulating a bird control program and/or are interested in a program at a large hub airport. A shotgun patrol was established as a scaring technique. R.S.F.

N85-19972# Air Force Engineering and Services Center, Tyndall AFB, Fla.
STAFF ASSISTANCE TO BASES FOR BIRD HAZARDS
Robert C. Kull, Jr. *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 301-308 refs (For primary document see N85-19938 11-03)
(AD-P004205) Avail: NTIS HC A16/MF A01 CSCL 01/3

One of the primary functions of the Air Forces' bird/aircraft strike wazard (BASH) team is to assist bases worldwide with their bird hazards. Due to the wide variety of environments of bases, as well as the diverse missions of the aircraft, in-depth staff assistance proves to be a real challenge. Coupled with these difficulties is the added problem of personnel reassignment which does not allow for corporate memory to exist for an extended period of time. To combat these problems, the BASH team has written a BASH guidance package, a base self-inspection checklist, and the handbook on bird management and control. In addition to these publications, the team provides on-site assistance for specific and more difficult situations. Each of these items are described in detail herein. Author

N85-19973# Military Airlift Command, Scott AFB, Ill.
BIRD STRIKE AVOIDANCE SYSTEM FOR DOVER AFB, DELAWARE
Paul Desaulniers *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 309-314 (For primary document see N85-19938 11-03)
(AD-P004206) Avail: NTIS HC A16/MF A01 CSCL 01/3

The Traffic Control and Landing System (TRACALS) Directorate, Military Airlift Command (MAC/DCF) developed, tested, and implemented an innovative bird strike advisory system for aircraft operations at Dover AFB, DE. With the support and participation of representatives from HQ Air Force Systems Command (AFSC), HQ Air Force Communications Command (AFCC), Rome Air Development Center (RADC), Air Force Engineering and Services Center (AFESC), and the USAF Airlift Center (USAFALCENT), HQ MAC/DCF successfully conducted problem analyses and the evaluation of solution alternatives to alleviate a severely critical instrument flight rule (IFR) safety hazard. The resultant procedures have greatly contributed to diminishing the bird strike hazard in the Dover flying area, and achieved establishment of an effective bird detection/advisory system. System limitations have been identified and are being addressed through equipment enhancements and local community cooperation. Author

N85-19974# Directorate of Civil Aviation, Copenhagen (Denmark).
BIRD STRIKE COMMITTEE EUROPE
In PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 315-318 (For primary document see N85-19938 11-03)
(AD-P004207) Avail: NTIS HC A16/MF A01 CSCL 01/3

The activities of the bird strike committee Europe (BSCE) are summarized. The focuses of the following six working groups of the committee are presented: aerodrome, analysis, bird movement, radar and other sensors, communications, and structural testing of airframes. R.S.F.

N85-19975# Fish and Wildlife Service, Denver, Colo. Wildlife Research Center.
BIRDS AND AIRPORT AGRICULTURE IN THE CONTERMINOUS UNITED STATES: A REVIEW OF LITERATURE c09
R. T. Sterner, D. J. Elias, M. V. Garrison, B. E. Johns, and S. R. Kilburn *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 319-330 refs (For primary document see N85-19938 11-03)
(AD-P004208) Avail: NTIS HC A16/MF A01 CSCL 01/5

Literature pertinent to the use of airport lands for agriculture in the conterminous United States is reviewed and analyzed. Articles are used that document bird utilization of 85 crops, rate the appropriateness of 15 farming activities for airports, and identify the North American bird species that utilize these crops and activities. Fifty-seven crops were documented as utilized by at least one species; no reports of bird use were found for 28 crops. Only non-pasture stock farming is suitable for practice within two miles of the airport center. Although numerous reports have designated gulls as the most hazardous species to air traffic, evidence suggests that certain species of blackbirds, waterfowl, and gallinaceous birds pose greater hazards. R.S.F.

N85-19976# Federal Aviation Administration, Washington, D.C. Accident Counsel Branch.
THE FAA GRANT-IN-AID ASSURANCES: FAR PART 139, AND AIRPORT HAZARDS c09
Andrew J. Dilk *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 331-368 (For primary document see N85-19938 11-03)
(AD-P004209) Avail: NTIS HC A16/MF A01 CSCL 01/5

The promises made to the FAA by airport operating authorities, which are found in grants-in-aid, or as a result of certification under 14 C.F.R. Part 139, are more than agreements for construction compliance. They can prove to be the basis of multi-million dollar lawsuits where hazards exist in the airport environment, and are found by courts to be the proximate cause of an aviation accident. Grants-in-aid and regulations are discussed in detail. Specific legal cases are also presented. R.S.F.

N85-19977# Illinois Natural History Survey, Urbana. Section of Wildlife Research.
THE POTENTIAL OF THE NEXRAD RADAR SYSTEM FOR WARNING OF BIRD HAZARDS
Ronald P. Larkin *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 369-379 refs (For primary document see N85-19938 11-03)
(AD-P004210) Avail: NTIS HC A16/MF A01 CSCL 01/3

Flying birds pose a dangerous and costly problem for aviation. Warning pilots of hazardous movements of birds could be available with the next generation weather radar (NEXRAD) currently being developed cooperatively by three U.S. government agencies. For several kinds of bird hazards, it should be feasible to develop computer algorithms to provide automated hazard warnings in real time. Reflectivity, Doppler speed, and differential reflectivity data taken with a prototype 10-cm NEXRAD radar establish the usefulness of NEXRAD for obtaining information on birds. Author

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-20762# Aerospace Corp., Los Angeles, Calif.
GPS SYSTEM FIELD TESTING
J. M. Clifford *In* AGARD Space System Applications to Tactical Operations Oct. 1984 17 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

N85-20764# Aerospace Corp., Los Angeles, Calif.
COVERAGE AND BUILDUP OF THE NAVSTAR CONSTELLATION
P. Kruh *In* AGARD Space System Applications to Tactical Operations Oct. 1984 10 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-19978*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
STUDY OF ADVANCED FUEL SYSTEM CONCEPTS FOR COMMERCIAL AIRCRAFT
G. A. Coffinberry Jan. 1985 256 p refs
(Contract NAS3-23267)
(NASA-CR-174751; NAS 1.26:174751; R85AEB166) Avail: NTIS HC A12/MF A01 CSCL 01C

An analytical study was performed in order to assess relative performance and economic factors involved with alternative advanced fuel systems for future commercial aircraft operating with broadened property fuels. The DC-10-30 wide-body tri-jet aircraft and the CF6-80X engine were used as a baseline design for the study. Three advanced systems were considered and were specifically aimed at addressing freezing point, thermal stability and lubricity fuel properties. Actual DC-10-30 routes and flight profiles were simulated by computer modeling and resulted in prediction of aircraft and engine fuel system temperatures during a nominal flight and during statistical one-day-per-year cold and hot flights. Emergency conditions were also evaluated. Fuel consumption and weight and power extraction results were obtained. An economic analysis was performed for new aircraft and systems. Advanced system means for fuel tank heating included fuel recirculation loops using engine lube heat and generator heat. Environmental control system bleed air heat was used for tank heating in a water recirculation loop. The results showed that fundamentally all of the three advanced systems are feasible but vary in their degree of compatibility with broadened-property fuel. B.W.

N85-19979*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PARAMETRIC STUDY OF A CANARD-CONFIGURED TRANSPORT USING CONCEPTUAL DESIGN OPTIMIZATION
P. Douglas Arbuckle and Steven M. Sliwa Mar. 1985 28 p refs (NASA-TP-2400; L-15856; NAS 1.60:2400) Avail: NTIS HC A03/MF A01 CSCL 01C

Constrained-parameter optimization is used to perform optimal conceptual design of both canard and conventional configurations of a medium-range transport. A number of design constants and design constraints are systematically varied to compare the sensitivities of canard and conventional configurations to a variety of technology assumptions. Main-landing-gear location and canard surface high-lift performance are identified as critical design parameters for a statically stable, subsonic, canard-configured transport. Author

N85-19980*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OVER THE WING PROPELLER Patent Application
Joseph L. Johnson, Jr. and E. Richard White, inventors (to NASA) (Kentron International, Inc., Hampton, Va.) Filed 16 Oct. 1984 12 p
(NASA-Case-LAR-13134-1; NAS 1.71:LAR-13134-1; US-Patent-Appl-SN-661478) Avail: NTIS HC A02/MF A01 CSCL 01C

An aircraft system for increasing the lift drag ratio over a broad range of operating conditions is described. The system positions the engines and nacelles over the wing in such a position that gains in propeller efficiency is achieved simultaneously with increases in wing lift and a reduction in wing drag. Adverse structural and torsional effects on the wings are avoided by fuselage mounted pylons which attach to the upper portion of the fuselage aft of the wings. Similarly, pylon wing interference is eliminated by moving the pylons to the fuselage. Further gains are achieved by locating the pylon surface area aft of the aircraft center of gravity, thereby augmenting both directional and longitudinal stability. This augmentation has the further effect of reducing the size, weight and drag of empennage components. The combination of design changes results in improved cruise performance and increased climb performance while reducing fuel consumption and drag and weight penalties. NASA

N85-19981*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REMOTE PIVOT DECOUPLER PYLON: WING/STORE SUPPRESSION Patent Application
John M. Hassler, Jr., inventor (to NASA) Filed 10 Jan. 1985 16 p
(NASA-Case-LAR-13173-1; NAS 1.71:LAR-13173-1; US-Patent-Appl-SN-690274) Avail: NTIS HC A02/MF A01 CSCL 01C

A device for suspending a store from an aerodynamic support surface, such as an aircraft wing, and more specifically, for improving upon singlet pivot decoupler pylons by reducing both frequency of active store, alignment and alignment system space and power requirements. Two links suspend a lower pylon/rack section, and releasable attached store from an upper pylon section mounted under wing. The links allow the lower pylon section to rotate in pitch about a remote pivot point. A leaf spring connected between the lower section and electrical alignment system servomechanism provides pitch alignment of the lower section/store combination. The servomechanism utilizes an electric servomotor to drive gear train and reversibly move the leaf spring, thereby maintaining the pitch attitude of store within acceptable limits. Damper strokes when lower section rotates to damp large oscillations of store. NASA

N85-19982# European Space Agency, Paris (France).
FIRST STAGE OF EQUIPPING A DO 28 AS A RESEARCH AIRCRAFT FOR ICING, AND FIRST RESEARCH RESULTS
Hans-Eberhard Hoffmann and Johann Demmel Jul. 1984 63 p refs Transl. into ENGLISH of "Erste Ausruestungsstufe einer Do 28 zum Vereisungsforschungsflugzeug u. erste Untersuchungsergebnisse', DFVLR, Oberpfaffenhofen, West Ger. Rept. DFVLR-FB-83-40, Nov. 1983 Original language document previously announced as N84-24571
(ESA-TT-855; DFVLR-FB-83-40) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 22,50

A Do 28 aircraft was equipped for measuring liquid water

content, LWC (2 types of instrument), temperature, relative humidity, backscatter coefficient, and ice accretion (on 3 different standard cylinders). During winter flights, the thickness of ice accretion on the standard cylinders increases linearly with LWC between an LWC of 0.06 and 0.30 g/cum; the thinner the cylinder, the thicker the ice accretion; ice accretion increases significantly with a drop in temperature of only a few degrees; good agreement is shown between 2 different types of instruments for measuring LWC.
Author (ESA)

N85-20186# Joint Publications Research Service, Arlington, Va.
AIRBUS FATIGUE TESTS Abstract Only
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 37 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 22 Nov. 1984 p 15 (For primary document see N85-20183 11-31)
Avail: NTIS HC A05/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-19983# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
ADAPS (AIRBORNE DATA ACQUISITION AND PROCESSING SYSTEM) OPERATION AND MAINTENANCE MANUAL
R. T. Miles Mar. 1984 155 p
(AD-A149297; NORDA-TN-265) Avail: NTIS HC A08/MF A01 CSCL 08/10

In the summer of 1982, an Airborne Data Acquisition and Processing System (ADAPS) was developed. The ADAPS is a user-programmable data acquisition system for use aboard RP-3A aircraft operated by the U.S. Naval Oceanographic Office. It is designed for rapid collection, editing and storage of data from aircraft launched expendable bathythermographs (AXBT's) and from various aircraft meteorological sensors. This manual describes the installation, functional operation, interconnections for system set-up and operating software programs of the developed system. The system is very flexible in that the user can easily modify any of the software programs provided with the system or develop new programs which tailor system performance to specific needs. The system electronics are modularly designed so that failures can be corrected by rapid replacement of printed circuit cards. Installation and use of ADAPS has resulted in the automation of many airborne survey tasks which were previously accomplished in a more time consuming manner. Ocean thermal profile data can now be provided to fleet interests on a more timely basis, and post processing of survey data for research purposes is improved due to availability of both thermal profiles and meteorological data along with time and position information all on one storage media. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-19984# Massachusetts Inst. of Tech., Cambridge.
STUDY OF DEPOSITION CONTROL USING TRANSPIRATION Progress Report
Jean F. Louis and Hamdi Kozlu Nov. 1984 8 p
(Contract DE-AC21-83MC-20334)
(DE85-003463; DOE/MC-30334/T13) Avail: NTIS HC A02/MF A01

Progress is reported on a project to determine the conditions under which transpiration may be actually used to avoid the deposition of small particles. The application of this work is the control of the deposition of small particles over a surface kept at a temperature below the melting point of compounds likely to exist in the combustion products. A combined experimental and theoretical research program will be carried out to evaluate the concept of transpiration as a deposition control strategy. A first order theory will be refined by introducing an appropriate turbulence model. The experimental program is designed to evaluate and refine the theoretical model under conditions which provide the correct Reynolds and Stokes numbers. The experimental setup consists of a wind tunnel with a test section containing a flat porous transpired section. The measurements will determine the distribution of velocity and of particle concentration in the boundary layer. The experiments will be conducted for different particle sizes under conditions simulating gas turbine conditions. DOE

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-19985* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LEADING EDGE FLAP SYSTEM FOR AIRCRAFT CONTROL AUGMENTATION Patent
Dhanvada M. Rao, inventor (to NASA) (Old Dominion Univ.) Issued 4 Dec. 1984 9 p Filed 12 Aug. 1983 Continuation of abandoned US Patent Appl. SN-301078, filed 10 Sep. 1981 Sponsored by NASA
(NASA-Case-LAR-12787-2; NAS 1.71:LAR-12787-2; US-Patent-4,485,992; US-Patent-Appl-SN-5226628; US-Patent-Appl-SN-301078; US-Patent-Class-244-90R; US-Patent-Class-244-214) Avail: US Patent and Trademark Office CSCL 01C

Traditional roll control systems such as ailerons, elevons or spoilers are least effective at high angles of attack due to boundary layer separation over the wing. This invention uses independently deployed leading edge flaps on the upper surfaces of vortex stabilized wings to shift the center of lift outboard. A rolling moment is created that is used to control roll in flight at high angles of attack. The effectiveness of the rolling moment increases linearly with angle of attack. No adverse yaw effects are induced. In an alternate mode of operation, both leading edge flaps are deployed together at cruise speeds to create a very effective airbrake without appreciable modification in pitching moment. Little trim change is required.
Official Gazette of the U.S. Patent and Trademark Office

N85-19986# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ROBUSTNESS OF DISCRETE-TIME DYNAMICAL SYSTEMS: APPLICATION TO THE MULTIVARIABLE DIGITAL CONTROL OF COMBAT AIRCRAFT Ph.D. Thesis - Inst. Industriel du Nord, Lille
Yves Joannic 1984 130 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-906) 2 Vol.
(ONERA-NT-1984-2; ISSN-0078-3781) Avail: NTIS HC A07/MF A01

A method to compute optimal feedback laws, capable of maintaining accurate tracking despite constantly acting disturbances, is developed and applied to the flight control problem of a combat aircraft. A formalism reduces robustness to preservation of stability of a properly augmented system, providing results which quantify the generalized structural robustness of a recurrent

nonlinear multiloop system. Having extended the Lyapounov criterion to systems having a dynamical feedback, classical concepts of stability margin and gain and phase margins are generalized to the multivariable discrete case. Analytical expressions allow measurement of the margins when dynamical or nonlinear disturbances affect the feedback channels. In linear-quadratic regulators, the margins are linked to penalty matrices of the cost function, allowing optimization of margins, while taking into account the algebraic structure of expected multiplicative perturbations. By application of external stability theorems to a recurrent system, admissible additive disturbances which do not destabilize the controlled system are measured. Author (ESA)

N85-19987# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction des Etudes de Synthese.
ROBUSTNESS OF CONTINUOUS MULTIVARIABLE FLIGHT CONTROLS Final Report [ROBUSTESSE DES REGULATEURS DE PILOTAGE MULTIVARIABLES CONTINUS]
O. L. Mercier 26 Jun. 1984 27 p refs In FRENCH
(Contract DRET-81.34.369)
(ONERA-RT/12/7224/SY) Avail: NTIS HC A03/MF A01

Theoretical results on the robustness of controllers are discussed with focus on tolerance of additive and multiplicative perturbations and conditions of robustness bearing on the matrix of the difference of feedback. General recommendations are given for the establishment of a robust controller as well as for the case of a linear quadratic controller. The establishment of aircraft flight controller at two levels is discussed. Transl. by A.R.H.

N85-19988# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction des Etudes de Synthese.
ROBUSTNESS OF CONTINUOUS MULTIVARIABLE FLIGHT CONTROLS [ROBUSTESSE DES REGULATEURS DE PILOTAGE MULTIVARIABLES]
O. L. Mercier 26 Jun. 1984 152 p refs In FRENCH
(Contract DRET-81.34.369)
(ONERA-RT/11/7224/SY) Avail: NTIS HC A08/MF A01

The state of the art of robust multivariable control is reviewed, and frequency domain flight control systems are described. A two level flight control for a combat aircraft is presented. A program which improves flyability and optimizes control robustness is outlined. Author (ESA)

N85-19989# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Flaechenflugzeuge.
IN-FLIGHT INVESTIGATION OF THE EFFECTS OF TIME DELAY IN CONTROL SYSTEM ON FLYING QUALITIES IN LANDING APPROACH
Knut Wilhelm and Dietrich Altenkirch Oct. 1984 92 p refs
(DFVLR-FB-84-35; ISSN-0171-1342) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 30

An in-flight flight simulator was used to investigate the influence of time delay in control system on the landing approach flying qualities of a business jet aircraft. Time delay in the longitudinal and lateral control system was varied from 0 to 1300 msec. Three pilots flew 10 configurations in a total of 128 ILS approaches under different atmospheric conditions. Cooper-Harper pilot ratings and special effort ratings, as well as statistical values computed from measured performance data of the pilot-aircraft system are presented as a function of time delay and turbulence intensity. The flight results were compared with handling qualities criteria. Results show that flying qualities in pitch and roll are highly affected by control system time delays, especially the lateral axis.
Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-19990* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
INFLIGHT IFR PROCEDURES SIMULATOR Patent
Loyd C. Parker, inventor (to NASA) Issued 25 Dec. 1984 9 p Filed 11 Jun. 1982 Supersedes N82-29331 (20 - 20, p 2791)
(NASA-Case-KSC-11218-1; NAS 1.71:KSC-11218-1;
US-Patent-4,490,117; US-Patent-Appl-SN-387649;
US-Patent-Class-434-35; US-Patent-Class-434-49;
US-Patent-Class-434-242; US-Patent-Class-434-243) Avail: US Patent and Trademark Office CSCL 14B

An inflight IFR procedures simulator for generating signals and commands to conventional instruments provided in an airplane is described. The simulator includes a signal synthesizer which generates predetermined simulated signals corresponding to signals normally received from remote sources upon being activated. A computer is connected to the signal synthesizer and causes the signal synthesizer to produce simulated signals responsive to programs fed into the computer. A switching network is connected to the signal synthesizer, the antenna of the aircraft, and navigational instruments and communication devices for selectively connecting instruments and devices to the synthesizer and disconnecting the antenna from the navigational instruments and communication device. Pressure transducers are connected to the altimeter and speed indicator for supplying electrical signals to the computer indicating the altitude and speed of the aircraft. A compass is connected for supply electrical signals for the computer indicating the heading of the airplane. The computer upon receiving signals from the pressure transducer and compass, computes the signals that are fed to the signal synthesizer which, in turn, generates simulated navigational signals.
Official Gazette of the U.S. Patent and Trademark Office

N85-19991# Oak Ridge National Lab., Tenn.
LIGHT YOUR RUNWAYS AND TAXIWAYS WITHOUT ELECTRICITY
K. W. Haff and J. A. Tompkins 25 Oct. 1984 26 p refs Presented at Workshop on the Manage. of Airfield Lighting, Clearwater Beach, Fla., 25 Oct. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000269; CONF-8410152-1) Avail: NTIS HC A03/MF A01

The history of the radioluminescent light program at Oak Ridge National Laboratory is from the earliest use of radium through strontium-90, carbon-14, and krypton-85 to the present work with tritium. Field testing of radioluminescent lights and safety and quality control are discussed. DOE

N85-19992# Community Planning and Development Inst. Washington, D.C.
INTERNATIONAL AIRPORT STUDY: HOW TO IMPROVE THE EFFECT OF AIRPORTS ON TRADE AND ON EXPORT-RELATED INDUSTRIES Final Report
Apr. 1984 192 p refs
(Grants EDA-RED-798-G-82-15; EDA-99-7-13606)
(PB85-124923; EDA/RED-84-32) Avail: NTIS HC A09/MF A01 CSCL 01E

A two part study was conducted to: (1) identify and describe the promotional techniques used by international airports in the U.S. to enhance trade and tourism, and (2) to recommend for the consideration of Federal and local officials, airport administrators, and the business community ways in which trade and tourism through international airports can be increased. The study describes the economic benefits that have accrued in the tourism, trade, and export sectors of the communities where international airports

are located. The study's recommendations are backed by case studies of the performances, needs, and plans of four international airports considered to be among the United States most promising for trade and tourism. It is recognized that, because of the expanding reliance on international air travel and transportation, airport facilities constitute an increasingly critical commercial and industrial link to growth. GRA

N85-19993# Office of Technology Assessment, Washington, D.C.
AIRPORT SYSTEM DEVELOPMENT
Aug. 1984 279 p
(PB85-127793; OTA-STI-84; LC-84-801101) Avail: NTIS HC A13/MF A01 CSCL 01E

Present conditions and future needs of the Nation's airports were examined, with emphasis on possible solutions to problems of operational capacity and air travel delay. The range of remedial actions considered included improved airport and air travel delay, air traffic control technology, revised procedures for airport and airspace use, economic and regulatory measures to reduce demand during peak periods and managerial approaches to make more efficient use of existing airport facilities. Special attention is given to issues of airport planning and funding methods at Federal, State and local levels. GRA

N85-19959# Thurlow and Associates Environmental Control Consultants Ltd., Ottawa (Ontario).
AIRPORT SITE SELECTION AND DESIGN
William J. Thurlow *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 189-194 refs (For primary document see N85-19938 11-03)
(AD-P004193) Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19960# German Board for Birdstrike Prevention, Traben-Trarbach (West Germany).
LANDSCAPE MANAGEMENT ON AIRPORTS FOR REDUCTION OF BIRD POPULATIONS
Jochen Hild *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 195-206 refs (For primary document see N85-19938 11-03)
(AD-P004194) Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19961# Leadville Airport, Inc., Colo.
INEXPENSIVE MULTIPURPOSE LANDSCAPING
Ursula Gilgulin *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 207-208 (For primary document see N85-19938 11-03)
Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19962# Thurlow and Associates Environmental Control Consultants Ltd., Ottawa (Ontario).
REDUCING GULL USE OF SOME ATTRACTIONS NEAR AIRPORTS
Victor E. F. Solman *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 209-212 refs (For primary document see N85-19938 11-03)
(AD-P004195) Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19963# Federal Aviation Administration, Washington, D.C.
FAA POLICY REGARDING SOLID WASTE DISPOSAL FACILITIES
Michael J. Harrison *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 213-218 (For primary document see N85-19938 11-03)
(AD-P004196) Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19964# PEER Consultants, Inc., Rockville, Md.
AIRPORT BIRD HAZARDS ASSOCIATED WITH SOLID WASTE DISPOSAL FACILITIES
David W. Lake *In its* Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 219-230 refs (For primary document see N85-19938 11-03)
(AD-P004197) Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19969# Portland International Airport, Oreg.
DEVELOPMENT OF BIRD HAZARD REDUCTION FOR AIRPORT OPERATIONAL SAFETY
Kaye Reznick *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 275-286 refs (For primary document see N85-19938 11-03)
(AD-P004202) Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19975# Fish and Wildlife Service, Denver, Colo. Wildlife Research Center.
BIRDS AND AIRPORT AGRICULTURE IN THE CONTERMINOUS UNITED STATES: A REVIEW OF LITERATURE
R. T. Sterner, D. J. Elias, M. V. Garrison, B. E. Johns, and S. R. Kilburn *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 319-330 refs (For primary document see N85-19938 11-03)
(AD-P004208) Avail: NTIS HC A16/MF A01 CSCL 01/5

N85-19976# Federal Aviation Administration, Washington, D.C. Accident Counsel Branch.
THE FAA GRANT-IN-AID ASSURANCES: FAR PART 139, AND AIRPORT HAZARDS
Andrew J. Dilk *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 331-368 (For primary document see N85-19938 11-03)
(AD-P004209) Avail: NTIS HC A16/MF A01 CSCL 01/5

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-19994# Austrian Solar and Space Agency, Vienna.
[ACTIVITIES REPORT IN SPACE RESEARCH IN AUSTRIA]
Jun. 1984 59 p refs Presented at the 25th COSPAR Plenary Meeting held in Graz, 25 Jun. - 7 Jul. 1984
Avail: NTIS HC A04/MF A01

Austrian research in atmospheric physics, magnetic fields, on Spacelab, and connected with Halley's comet is described. Satellite astronomy, geodesy, meteorology, and geodynamics projects are summarized. Planetology and cosmic chemistry; communication and wave propagation; photogrammetry; and plasma physics programs are reviewed. Author (ESA)

N85-19995# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
[ACTIVITIES IN FRENCH AEROSPACE] Annual Report, 1983
18 May 1984 167 p refs Original contains color illustrations
Avail: NTIS HC A08/MF A01

Aerospace research including a Spacelab upper atmosphere infrared absorption study; fighter aerodynamics research; military aircraft air intake study; analysis of sensitivity to turbulence and how to eliminate it; transport aircraft aerodynamics; high speed aircraft propeller design; flexible helicopter rotors; high resolution laser imaging system; and detection of aerosols blown up by helicopters is summarized. Test facilities and product developments are described. Author (ESA)

N85-19996 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
PRELIMINARY CONCEPTS OF CANDIDATE ELEMENTS FOR A POTENTIAL EUROPEAN PARTICIPATION IN A MANNED SPACE STATION
W. Wienss (Erno Raumfahrtechnik G.m.b.H., Bremen, West Germany) and E. Vallerani (Aeritalia S.p.A., Turin) 1984 31 p Presented at 35th Intern. Astron. Federation Congr., Lausanne, 7-13 Oct. 1984
(MBB-UR-E-749-84-O) Avail: Issuing Activity

Elements for a permanently or partly manned space station which can be built and operated by European organizations are proposed. These include pressurized and unpressurized elements similar to Spacelab module and pallet; free-flying platforms with

payload carrying capability between 1.5 and 2.5 tons; an orbital propulsion system to provide in-orbit maneuverability; and a teleoperated service vehicle for in-orbit repair and maintenance. Logistics storage-resupply elements; a hangar/shelter workshop unit; communication equipment; and mechanisms for antenna deployment, retractable masts, etc., are also of interest.
Author (ESA)

N85-19997 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
THE SERVICING VEHICLE OF COLUMBUS
E. Baune and L. DEmiliano (Aeritalia) 1984 16 p Presented at 35th Intern. Astron. Federation Congr., Lausanne, 7-13 Oct. 1984 (MBB-UR-E-750-84-O) Avail: Issuing Activity

An orbital servicing vehicle for the Columbus manned space station is proposed. It provides transportation, servicing, and repair capabilities. Design is based on unmanned operation, with manned operations covered by add-on modules. Propulsion options; thermal performance; subsystem and module design; and in-orbit maneuvers are discussed.
Author (ESA)

N85-20083# Joint Publications Research Service, Arlington, Va.
ALLOY SUPERCOOLING ON SALYUT-7 Abstract Only
I. Melenevskiy *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 53 Transl. into ENGLISH from Trud (Moscow), 11 Apr. 1984 p 4 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20207# Joint Publications Research Service, Arlington, Va.
PRC JOURNAL DISCUSSES 'STAR WARS' SPACE PROGRAM
Qubing Zhuang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 1-8 Transl. into ENGLISH from Shijie Zhishi (China), no. 19, 1 Oct. 1984 p 7-9 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20346*# Rome Univ. (Italy).
SCIENCE APPLICATIONS, PART 1
Franco Mariani *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p refs (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20347*# National Aeronautics and Space Administration, Washington, D. C.
SCIENCE APPLICATIONS, PART 2
James P. Murphy *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 18 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20349*# California Univ., San Diego, La Jolla.
TRANSPORTATION APPLICATIONS, PART 1
Joseph Carroll *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 27 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20350*# Aeritalia S.p.A., Rome (Italy).
TRANSPORTATION APPLICATIONS, PART 2
Enrico Lorenzini *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 14 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20355*# National Aeronautics and Space Administration, Washington, D. C.
SUMMARY PRESENTATION OF THE SCIENCE APPLICATIONS PANEL
Robert Hudson *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 7 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20357*# Lockheed Corp., Burbank, Calif.
SUMMARY PRESENTATION OF THE TRANSPORTATION PANEL
Maxwell W. Hunter *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 15 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20359*# Martin Marietta Corp., Denver, Colo.
SUMMARY PRESENTATION OF THE CONSTELLATIONS PANEL
Frank Williams *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20360*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUMMARY PRESENTATION OF THE TECHNOLOGY AND TEST PANEL
Paul Siemers *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

N85-20362*# National Aeronautics and Space Administration, Washington, D. C.
SPACE SCIENCE AND APPLICATIONS
Robert Hudson, Hasso B. Niemann (NASA. Goddard Space Flight Center), Werner D. Kahn (NASA. Goddard Space Flight Center), James P. Murphy, Gerald M. Keating (NASA. Langley Research Center), Sergio Vetrella (Naples Univ., Italy), Will Webster (NASA. Goddard Space Flight Center), Joe Martin (Martin Marietta), Ray Schneider (Sperry), and Franco Mariani (Rome Univ., Italy) *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 6 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22A

N85-20364*# Aeritalia S.p.A., Torino (Italy).
REPORT OF THE TRANSPORTATION PANEL
Ernesto Vallerani, Maxwell W. Hunter (Lockheed Missiles and Space Co.), Peter M. Bainum (Howard Univ.), Vinod J. Modi (British Columbia Univ.), Karl A. Faymon (NASA. Lewis Research Center), Ben Chang (Space Communication Company), Steven Lewis (NASA. Johnson Space Center), Jerry Yglesias (NASA. Johnson Space Center), Larry Edwards (NASA, Washington), Rudolph Adornato (Grumman Aerospace) et al *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 56 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22A

N85-20374*# Rome Univ. (Italy).
STUDY PROPOSAL FOR THE POSSIBLE USE OF ISS AS AN AERODYNAMIC FACILITY FOR AEROSPACE APPLICATIONS
Carlo Buonjiolno *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 5 p refs (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N85-19998# Department of the Air Force, Washington, D.C.
MISSILE LAUNCHER INTEGRAL SHOCK ISOLATION AND RUNNING GEAR SYSTEM Patent Application
C. Brumen, inventor (to Air Force) Filed 15 Nov. 1984 19 p (AD-D011490; US-Patent-Appl-SN-671391) Avail: NTIS HC A02/MF A01 CSCL 16/1

An integral, shock-isolated running gear unit for incorporation into a missile launcher is discussed. These integral units compromise a combination of actuators and rolling devices which are cooperable with tracks defined in opposite walls of a shelter for controlling the displacement of the launcher within the shelter. Such arrangement further includes swing arms which provide for isolation of the launcher from environmental shock waves transmitted to the launcher via the shelter. An additional shock absorbing function may be performed by the above said actuators. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-19999# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
FUTURE LAUNCHING SYSTEMS, 3RD PROSPECTIVE PHASE Final Report
M. Villain Paris ESA 5 Jul. 1983 321 p refs (Contract ESA-5103/82)
(SNIAS-S/DT/Y-25-063; ESA-CR(P)-1948) Avail: NTIS HC A14/MF A01

Studies on the first and second stages, reusable fairing, and overall configuration of a European launcher for the late 1980's-1990's are summarized. Two semireusable launchers, a cryogenic one in a series configuration and a storable/cryogenic one in a parallel configuration are retained. Author (ESA)

N85-20344*# Aeritalia S.p.A., Naples (Italy).
SATELLITE MODULE DESIGN
Marcello Vignoli *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 19 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A02/MF A01 CSCL 22B

N85-20348*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTRODYNAMIC INTERACTIONS
Nobie H. Stone *In its* Appl. of Tethers in Space, Vol. 1 Mar. 1985 17 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22B

N85-20352*# California Univ., San Diego, La Jolla.
CONSTELLATIONS
David R. Criswell *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 13 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22B

N85-20371*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PULTRUSION PROCESS FOR FABRICATION OF TETHERS (PRELIMINARY CONCEPTS)
Ian O. MacConochie and Maywood L. Wilson *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 15 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22B

N85-20372*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTRUMENTATION FOR APPLICATION NUMBER 1: MASS SPECTROMETRIC ANALYSIS OF THE BOUNDARY LAYER ASSOCIATED WITH THE TETHERED SATELLITE
George M. Wood *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 18 p refs (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22B

N85-20376*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
THE SATELLITE SAIL
Jerome Pearson *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 6 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 02B

N85-20774# Centre National d'Etudes Spatiales, Paris (France).
THE ARIANE FAMILY [LA FAMILLE ARIANE]
R. Vignelles *In* AGARD Space System Applications to Tactical Operations Oct. 1984 6 p In FRENCH; ENGLISH summary (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-20000*# Rockwell International Corp., Downey, Calif. Space Transportation Systems Div.
SPACE TRANSPORTATION SYSTEM (STS) PROPELLANT SCAVENGING SYSTEM STUDY. VOLUME 1: TECHNICAL REPORT Final Report
Jan. 1985 293 p refs 3 Vol.
(Contract NAS9-16994)
(NASA-CR-171848-Vol-1; NAS 1.26:171848-Vol-1; DRL-T-1811-Vol-1; STS-84-0570-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 22B

The objectives are to define the most efficient and cost effective methods for scavenging cryogenic and storable propellants and then define the requirements for these scavenging systems. For cryogenic propellants, scavenging is the transfer of propellants from the Shuttle orbiter external tank (ET) and/or main propulsion subsystems (MPS) propellant lines into storage tanks located in the orbiter payload bay for delivery to the user station by a space based transfer stage or the Space Transportation System (STS) by direct insertion. For storable propellants, scavenging is the direct transfer from the orbital maneuvering subsystem (OMS) and/or tankage in the payload bay to users in LEO as well as users in the vicinity of the Space Station. B.G.

N85-20001*# Rockwell International Corp., Downey, Calif. Space Transportation Systems Div.
SPACE TRANSPORTATION SYSTEM (STS) PROPELLANT SCAVENGING SYSTEM STUDY. VOLUME 2: SUPPORTING RESEARCH AND TECHNOLOGY REPORT Final Report
Jan. 1985 17 p 3 Vol.
(Contract NAS9-16994)
(NASA-CR-171849-Vol-2; NAS 1.26:171849-Vol-2; DRL-T-1811-Vol-2; STS-85-0570-Vol-2) Avail: NTIS HC A02/MF A01 CSCL 22B

The technology effort required for the development of a propellant scavenging system is identified. For a cryogenic

propellant system, the development tests identified are for a cryogenic capillary acquisition system for zero-g feedout capability and for definition of existing Space Transformation System (STS) performance capabilities. For a storable propellant system, the development tests identified are for three major components required in the system: a propellant pump, a helium compressor, and a zero leakage fluid disconnect. Author

N85-20002*# Rockwell International Corp., Downey, Calif. Space Transportation Systems Div.
SPACE TRANSPORTATIOIN SYSTEM (STS) PROPELLANT SCAVENGING SYSTEM STUDY. VOLUME 3: COST AND WORK BREAKDOWN STRUCTURE-DICTIONARY Final Report
Jan. 1985 43 p 3 Vol.
(Contract NAS9-16994)
(NASA-CR-171850-Vol-3; NAS 1.26:171850-Vol-3; DRL-T-1811-Vol-3; STS-84-0570-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 22B

Fundamentally, the volumes of the oxidizer and fuel propellant scavenged from the orbiter and external tank determine the size and weight of the scavenging system. The optimization of system dimensions and weights is stimulated by the requirement to minimize the use of partial length of the orbiter payload bay. Thus, the cost estimates begin with weights established for the optimum design. Both the design, development, test, and evaluation and theoretical first unit hardware production costs are estimated from parametric cost weight scaling relations for four subsystems. For cryogenic propellants, the widely differing characteristics of the oxidizer and the fuel lead to two separate tank subsystems, in addition to the electrical and instrumentation subsystems. Hardwares costs also involve quantity, as an independent variable, since the number of production scavenging systems is not firm. For storable propellants, since the tankage volume of the oxidizer and fuel are equal, the hardware production costs for developing these systems are lower than for cryogenic propellants. Author

N85-20772*# National Aeronautics and Space Administration, Washington, D. C.
STATUS OF THE NATIONAL SPACE TRANSPORTATION SYSTEM Abstract Only
James A. Abrahamson *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01 CSCL 22B

N85-20773*# National Aeronautics and Space Administration, Washington, D. C.
SHUTTLE/CENTUAR UPPER STAGE CAPABILITY
Harry J. Clark *In* AGARD Space System Applications to Tactical Operations Oct. 1984 5 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01 CSCL 22B

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N85-20173# Joint Publications Research Service, Arlington, Va.
TELEMETRY SYSTEMS OF INTERKOSMOS SATELLITES
Tamas Hetenyi *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 43-44 Transl. into ENGLISH from Magyar Elektron. (Budapest), no. 1, 1984 p 95 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-20003# Los Alamos Scientific Lab., N. Mex.
EFFECTS OF THE SOLAR-TERRESTRIAL ENVIRONMENT ON SATELLITE OPERATIONS
Daniel N. Baker 1984 18 p refs Presented at the Solar-Terrestrial Prediction Workshop, Meudon (France), 18-19 Jun. 1984
(Contract W-7405-eng-36)
(DE85-002413; LA-UR-84-3325; CONF-8406220-1) Avail: NTIS HC A02/MF A01

Hot plasma and energetic particle populations in space are known to produce spacecraft operational anomalies. In the inner part of the Earth's magnetosphere, these effects are primarily due to durably trapped radiation belt particles, and the integrated doses can be calculated quite accurately for any given orbit. In the outer magnetosphere many spacecraft operational problems appear to be due to intense, transient phenomena. It is shown that three types of naturally-occurring, and highly variable, hostile particle radiation environments are encountered at, or near, the geostationary orbit: (1) high-energy protons due to solar flares; (2) very high energy electrons (2-10 MeV) of unknown origin; and (3) energetic ions and electrons produced by magnetospheric substorms. Present particle sensor systems provide energetic particle detection and assessment capabilities during these kinds of high-engery radiation events. Numerous operational anomalies and subsystem problems occurred during each type of event period and the association of such uspets is demonstrated. Methods of prediction of magnetospheric disturbances are discussed, and overall recommendations are made for dealing with this continuing problem. DOE

N85-20176# Joint Publications Research Service, Arlington, Va.
FRG'S DFVLR READY FOR PARTICIPATION IN SPACE STATION
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 3 Transl. into ENGLISH from Frankfurter Allgem. Zeitung (Frankfurt/Main), 3 Dec. 1984 p 10 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

N85-20369*# Padua Univ. (Italy). Inst. of Applied Mechanics.
SOME ASPECTS OF ATTITUDE STABILITY OF TETHERED SPACE STATIONS
Silvio Bergamasui *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 13 p refs (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N85-20004# ANT Nachrichtentechnik, Backnang (West Germany). Fachbereich Raumfahrt.
DEVELOPMENT OF A 20 GHz MODULATOR FOR THE PAYLOAD OF A SATELLITE FOR PROPAGATION AND TRANSMISSION EXPERIMENTS, INCLUDING THE REQUIRED CONVERTERS OF THE TEST EQUIPMENT Final Report, May 1982
Michael Alberty, Siegfried Boerner, and Gerhard Ohm Bonn Bundesministerium fuer Forschung und Technologie Oct. 1984 78 p refs In GERMAN; ENGLISH summary Sponsored by

Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-044; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16.50

Design and performance of a 20 GHz QPSK modulator for a 20/30 GHz satellite system and the related test equipment for bit error rate measurements are described. The modulator is of the serial type realized in waveguide techniques (evanescent mode with PIN diodes and circulators). With a bandwidth of 800 MHz and a temperature range from 10 to 40 C, the mean phase deviation is 3 deg with a maximum amplitude deviation of 0.3 dB. The modulator switching times are < 1nsec, allowing transmission rates of > 200 Mbit/sec. Measurements carried out with the test equipment prove that in the AM operating range the degradation increases by maximum 0.3 dB. Author (ESA)

N85-20005# Societe Europeenne de Propulsion, Vernon (France). Dept. Espace.
THE EURECA AUTOMATIC GRADIENT HEATING FACILITY (AGHF), PHASE A STUDY Final Report
20 Oct. 1983 87 p refs
(Contract ESA-5383/83/F)
(ESA-CR(P)-1939) Avail: NTIS HC A05/MF A01

The EURECA Automatic Gradient Heating Facility (AGHF) furnace operational performances (temperature and gradient level), low microgravity disturbance, and fulfilment of safety aspects for EURECA and STS were studied. Tradeoff results include selection of a furnace design offering higher gradient capacilities than specified even with high thermal conductivity materials, and selection of simple, direct drive mechanisms. The AGHF interface mounting area is 700 x 700 mm. Each subsystem (furnace, electronics, cylinder) can be removed separately. Critical components use proven technology. A computer code was developed to study the dynamic temperature field during pulling. The development plan is compatible with the very short time available to EURECA launch date. Interfaces with the user laboratory are indicated. Author (ESA)

N85-20006# Terma Elektronisk Industri A/S, Lystrup (Denmark). Space Group.
SOLUTION GROWTH FACILITY, PHASE A DESIGN STUDY, EXECUTIVE SUMMARY
Soeren Thomsen 8 Mar. 1983 23 p refs
(Contract ESA-5238/82)
(RPT/SGF/00014/TER; ESA-CR(P)-1946) Avail: NTIS HC A02/MF A01

The technical layout of the EURECA Solution Growth Facility (SGF) was derived from similar facilities developed for Spacelab First Payload and Long Duration Exposure Facility. The SGF system is a multiuser modular facility using qualified hardware and software where cost effective. Each SGF oven module consists of a chamber containing the multiuser reactor vessels. This gives equipment flexibility for other types of experiments which require stable temperature in the range 20 to 80C, e.g., vapor phase epitaxy. Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-20007*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STS-1 POGO ANALYSIS
Jun. 1981 115 p refs
(NASA-TM-87433; NAS 1.15:87433) Avail: NTIS HC A06/MF A01 CSCL 21H

Some of the pogo related data from STS-1 are documented. The measurements and data reduction are described. In the data analysis reference is made to FRF and single engine test results. The measurements are classified under major project elements of the space shuttle main engine, the external tank, and the orbiter. The subsystems are structural dynamics and main propulsion. Data were recorded onboard the orbiter with a minimum response rate of 1.5 to 50 Hz. The wideband, 14 track recorder was used, and the data required demultiplexing before reduction. The flight phase of interest was from liftoff through main engine cutoff. E.A.K.

N85-20008*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LOW LOSS INJECTOR FOR LIQUID PROPELLANT ROCKET ENGINES Patent Application
George L. vonPragenau, inventor (to NASA) Filed 10 Jan. 1985 16 p
(NASA-Case-MFG-25989-1; NAS 1.71:MFG-25989-1;
US-Patent-Appl-SN-690273) Avail: NTIS HC A02/MF A01 CSCL 21H

A low pressure loss injector element is disclosed for the main combustion chamber of a rocket engine which includes a lox post terminating in a cylindrical barrel. A lox plug received within the barrel which is threaded in the lox post and includes an interchangeable lox metering sieve which meters the lox into an annular lox passage. A second annular gas passage is coaxial with the annular lox passage. A cylindrical sieve surrounds the annular gas passage and includes an interchangeable gas metering sieve with metering orifices through which a hot gas passes into the annular passage. The jets which emerge from the annular lox passage and annular gas passage intersect at a point which is recessed away from the combustion area. The procedure enhances mixing and combustion stability. NASA

N85-20009# Argonne National Lab., Ill.
MIXING CHEMICAL REACTION AND FLOW FIELD DEVELOPMENT IN DUCTED ROCKETS
S. P. Vanka, R. R. Craig, and F. D. Stull Sep. 1984 50 p refs
(Contract W-31-109-eng-38)
(DE85-002710; ANL-84-62) Avail: NTIS HC A03/MF A01

Calculations were made of the three dimensional mixing, chemical reaction, and flow field development in a typical ducted rocket configuration. The governing partial differential equations are numerically solved by an iterative finite difference solution procedure. The physical models include the k approx. epsilon turbulence model, one step reaction, and mixing controlled chemical reaction rate. Radiation is neglected. The mean flow structure, fuel dispersal patterns, and temperature field are presented in detail for a base configuration with 0.058 m (2 in.) dome height, 45 deg side arm inclination, and with gaseous ethylene injected from the dome plate at an eccentric location. In addition, the influences of the geometrical parameters such as dome height, inclination of the side arms, and location of the fuel injector are studied. DOE

N85-20010# California Univ., Livermore. Lawrence Livermore Lab.
SHOCK PROPAGATION IN THE EXHAUST GAS HANDLING SYSTEM OF THE PROPOSED LARGE ALTITUDE ROCKET CELL: METHODS AND PRELIMINARY ANALYSIS
S. B. Sutton and R. E. Pierce 4 Oct. 1984 46 p refs
(Contract W-7405-eng-48)
(DE85-003055; UCID-20179) Avail: NTIS HC A03/MF A01

The analysis methods used to study the problem of the detonation of the propellant are discussed. The propagation of the shock wave inside the exhaust gas processing system, preliminary results are presented. The KOVEC computer code was used to simulate the detonation of 100,000 lbm TNT and develop a boundary prescription for use in the gas dynamics code GASPO which models the propagation of the shock wave through the LARC exhaust gas processing system. Results are presented showing the effect of cross-sectional area changes and variations

in the initial pressure in the gas processing system on the shock wave peak pressure and propagation speed. DOE

N85-20011# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
WINDOW ON SCIENCE VISIT TO THE USA, 21 MARCH - 22 APRIL, 1984
H. F. R. Schoeyer and P. A. O. G. Korting Apr. 1984 136 p refs Sponsored by US Office of Naval Research, Netherlands Foundation for Technical Research and Prins Maurits Laboratory TNO
(VTH-LR-426; PML-1984-C25; SFCC-Pub!-12) Avail: NTIS HC A07/MF A01

Dutch and American expertise in ramjet propulsion and combustion and solid propellant rocketry was discussed. A connected pipe facility for solid fuel ramjet combustion experiments; experiments with hybrid rocket motors and solid fuel ramjets; determination of the regression rate in solid fuel ramjets by ultrasonic pulse-echos; combustion of composite propellants at subatmospheric pressures; a model for the calculation of premixed flames; and low frequency oscillatory combustion are treated.
Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-20012# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
METALS AND CERAMICS DIVISION MATERIALS SCIENCE PROGRAM Annual Progress Report for period ending 30 Jun. 1984
C. J. McHargue and Sigfred Peterson Nov. 1984 178 p refs
(Contract DE-AC05-85OR-21400)
(DE85-003795; ORNL/TM-9357) Avail: NTIS HC A09/MF A01

The activities of the Materials Science Program in the Metals and Ceramics Division for the period January 1, 1983, to June 30, 1984 are summarized. These activities constitute about one-fourth of the research and development conducted by the division. The emphasis of the program can be described as the scientific design of materials. The efforts are directed toward three classes of materials: high-temperature metallic alloys based on intermetallic compounds, structural ceramics, and radiation-resistant alloys.
DOE

N85-20013# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
5 Feb. 1985 71 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-005) Avail: NTIS HC A04/MF A01

Various topics relating to Western European science and technology are presented, including advanced materials, automobiles, biotechnology, civil aviation, computers, factory automation, microelectronics, and technology transfer. For individual titles, see N85-20014 through N85-20018.

N85-20014# Joint Publications Research Service, Arlington, Va.
OVERVIEW OF MAJOR SWEDISH INSTITUTIONS IN POLYMER RESEARCH **c27**
Per Rydgren *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 1-8 Transl. into ENGLISH from Plastforum Scand. (Sweden), no. 10, 1984 p 64-68 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

The research activities of six Swedish technical college institutions involving polymer materials are enumerated. Polymerization, depolymerization, rubber technology, polymer fiber composites, and the chemical and mechanical properties of polymers are mentioned. R.S.F.

N85-20015# Joint Publications Research Service, Arlington, Va.
FRENCH WORK TOWARD FLEXIBLE SOFTWARE WORKSHOPS **c61**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 32-37 Transl. into ENGLISH from Le Nouvel Autom. (Paris), Oct. 1984 p 22-25 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

The software workshops of the future are discussed. Such workshops are to be composed of data base machines, language machines, and object machines and capable of generating software which can be used on a given target machine. R.S.F.

N85-20016# Joint Publications Research Service, Arlington, Va.
NOVEL CONCEPT IN DESIGN OF ASEA'S NEW ASSEMBLY ROBOT **c37**
Michel Defaux *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 44-45 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 11 Oct. 1984 p 54 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

A robot designed for industrial assembly applications is described. The arm configuration of the robot is discussed. R.S.F.

N85-20017# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM HAS MOST ADVANCED CONTINUOUS-CASTING MACHINE **c37**
Jean Roume *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 46-50 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 18 Oct. 1984 p 16-17 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

An automated continuous casting unit is described. A noteworthy capability of the unit is continuous optimization of slab width changes. The casting unit is controlled entirely from a single control room through a centralized data processing network. The process control architecture is built around a central TR80 computer. A remote controlled robot is involved in the casting operations. R.S.F.

N85-20018# Joint Publications Research Service, Arlington, Va.
SIEMENS, PHILIPS MEGAPROJECT TO YIELD SUPERCHIP IN 5 YEARS **c76**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 51-58 Transl. into ENGLISH from NRC Handelsblad (Rotterdam), 7 Nov. 1984 p 1 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

The development of computer chips using complementary metal oxide semiconductor (CMOS) memory technology is described. The management planning and marketing strategy of the Philips and Siemens corporations with regard to the memory chip are discussed. R.S.F.

24 COMPOSITE MATERIALS

Includes laminates.

N85-20019*# General Dynamics/Convair, San Diego, Calif.
DEVELOP AND DEMONSTRATE MANUFACTURING PROCESSES FOR FABRICATING GRAPHITE FILAMENT REINFORCED POLYMIDE (Gr/PI) COMPOSITE STRUCTURAL ELEMENTS Final Report
V. A. Chase and E. S. Harrison Feb. 1985 235 p refs
(Contract NAS1-14784)
(NASA-CR-172497; NAS 1.26:172497) Avail: NTIS HC A11/MF A01 CSCL 11D

A study was conducted to assess the merits of using graphite/polyimide, NR-150B2 resin, for structural applications on advanced space launch vehicles. The program was divided into two phases: (1) Fabrication Process Development; and (2) Demonstration Components. The first phase of the program involved the selection

of a graphite fiber, quality assurance of the NR-150B2 polyimide resin, and the quality assurance of the graphite/polyimide prepreg. In the second phase of the program, a limited number of components were fabricated before the NR-150B2 resin system was removed from the market by the supplier, Du Pont. The advancement of the NR-150B2 polyimide resin binder was found to vary significantly based on previous time and temperature history during the prepregging operation. Strength retention at 316C (600F) was found to be 50% that of room temperature strength. However, the composite would retain its initial strength after 200 hours exposure at 316C (600F). Basic chemistry studies are required for determining NR-150B2 resin binder quality assurance parameters. Graphite fibers are available that can withstand high temperature cure and postcure cycles. Author

N85-20020*# Drexel Univ., Philadelphia, Pa.
FRACTURE ANALYSIS OF NOTCHED COMPOSITES
F. Deale Feb. 1985 37 p refs
(Grant NAG1-480)
(NASA-CR-172563; NAS 1.26:172563) Avail: NTIS HC A03/MF A01 CSCL 11D

The problem of part-through cracks emanating from a central notch in a composite laminate is considered. The composite laminate is modeled as an orthotropic plate and along the branches, it is assumed that the stresses are carried by the fibers only. The stresses along the uncracked portions are assumed to be proportional to the crack opening displacement at the point. After formulating the branched crack problem, the model is applied to a(+45 deg)25 composite laminate. The stress concentration factors for the fibers are computed for various values of the spring constant K. Sample results showing the crack opening displacement are also displayed. Author

N85-20021# Materials Sciences Corp., Spring House, Pa.
THERMOVISCOELASTIC ANALYSIS OF DIMENSIONALLY STABLE FIBER COMPOSITE SPACE STRUCTURES Final Report, 15 Apr. 1983 - 30 Sep. 1984
Z. Hashin, E. A. Humphreys, and J. Goering Aug. 1984 58 p
(Contract F49620-83-C-0103)
(AD-A149275; MSC/TFR/1504/1504; AFOSR-84-1124TR) Avail: NTIS HC A04/MF A01 CSCL 11/4

An analytical program was performed in which the thermo-viscoelastic response of a polymeric matrix on unidirectional composite properties were investigated. The fibers were assumed to be linear, elastic, temperature independent transversely isotropic materials while the matrix was modelled as a linear thermo-viscoelastic, isotropic material. The matrix was characterized as a thermorheologically complex material. Micromechanical analyses using the composite cylinder assemblage and periodic hexagonal array were to model the unidirectional composite. Predicted composite response under combined thermal cycling and mechanical loadings demonstrated the significance of the temperature variation of the matrix material properties. GRA

N85-20022# Sandia Labs., Albuquerque, N. Mex.
COMPARISON OF METHODS FOR PREDICTING FIBER STRESSES IN A CRACKED KEVLAR/EPOXY MONOLAYER
E. D. Reedy, Jr. 1984 18 p refs Presented at ASME Winter Ann. Meeting, New Orleans, La., 9 Dec. 1984
(Contract DE-AC04-76DP-00789)
(DE84-016118; SAND-84-0867C; CONF-841201-11) Avail: NTIS HC A02/MF A01

Shear-lag and 3-D finite element predictions for the fiber stresses in a cracked Kevlar 49/epoxy monolayer are compared. Results are given for a 5-fiber wide monolayer containing a single broken fiber. It is found that both analysis methods predict nearly the same fiber stress distribution along the crack-tip fiber when the monolayer is fully elastic. Results for highly loaded monolayers with extensive matrix yielding are not in quite as good agreement, but even then the predicted stress distributions are within 5%. These calculations show that a shear-lag analysis is accurate even though the Kevlar 49 fiber is highly anisotropic. DOE

N85-20023# Mound Lab., Miamisburg, Ohio.
CHARACTERIZATION AND ADHESIVE BONDING OF POLY (ETHERETHERKETONE) RESINS AND COMPOSITES
R. B. Whitaker, A. Attalla, D. B. Sullenger, P. S. Wang, J. V. Dichiaro, and A. S. Kenyon (Monsanto Co., St. Louis) 1984 15 p refs Presented at 16th Natl. SAMPE Tech. Conf. on Mater. and Processes, Albuquerque, N. Mex., 9 Oct. 1984
(Contract DE-AC04-76DP-00053)
(DE85-002526; MLM-3164(OP); CONF-841055-5) Avail: NTIS HC A02/MF A01

Characterization and adhesive bonding studies of poly (etheretherketone) (PEEK) were conducted in relation to its use in wire coatings and in fiberglass-filled molding compounds. Thermal analyses show several PEEK resins to have essentially the same T sub g and T sub m values, indicating the same starting PEEK polymer was used. Differential scanning calorimetry annealing studies show the development of a second melting endotherm after annealing above T sub g. Both X-ray diffraction and DSC data indicate the degree of crystallinity of melt-processed PEEK or PEEK-fiberglass to be low, but an unprocessed PEEK resin powder was approx. 35% crystalline. Chemical and spectroscopic analyses support the predominant structural repeat unit of PEEK as being [O-phi-O-phi-CO-phi] (where phi = benzene). Molecular weights of two PEEK resins were determined by light scattering, to be 123,000 and 73,000. The critical surface tension of molded PEEK (neat) was determined by contact angle measurements to be approx. 36 to 39 dynes/cm, indicating PEEK to be a moderately low surface energy solid. However, acceptable bondability can be obtained for several adhesives following modification/activation of the PEEK surface. R.S.F.

N85-20024# Oak Ridge Y-12 Plant, Tenn.
ULTRASONIC ANALYSIS OF KEVLAR-EPOXY FILAMENT WOUND SPHERICAL TEST SPECIMENS
W. D. Brosey 6 Dec. 1984 32 p refs
(Contract DE-AC05-84OR-24100)
(DE85-005198; Y/DW-488) Avail: NTIS HC A03/MF A01

Increased use of composite materials in enclosed geometries such as cylindrical, spherical, or conical shapes led to the desire to transfer and further develop the most promising nondestructive evaluation (NDE) techniques used on nonenclosed geometries to enclosed geometries. Known defects were placed within spherical Kevlar-epoxy filament wound test specimens to determine the extent to which they could be detected. These effects included Teflon shim-simulated delaminations, macrosphere-simulated voids, dry-band sets, variable tension, Kevlar 29 fiber, and an alternate high void content winding pattern. Ultrasonic C-scan analysis of Kevlar-epoxy filament would spheres was performed to determine detectability of normal winding patterns and implanted flaw conditions in the composite using this technique. Ultrasonic waveform analysis was performed in both the time and frequency domains to determine the detectability and locatability of structural flaws within the composite. DOE

N85-20025# Los Alamos Scientific Lab., N. Mex. Materials Science and Technology Div.
TENSILE TESTING OF SIC WHISKERS
J. J. Petrovic 1984 13 p refs Presented at the Japan/US Seminar on Fundamentals of Struct. Ceram., Seattle, 1 Aug. 1984
(Contract W-7405-eng-36)
(DE85-003712; LA-UR-84-3524; CONF-8408133-1) Avail: NTIS HC A02/MF A01

The room temperature tensile mechanical properties of SiC whiskers were examined using a micro-tensile-test apparatus. SiC whiskers exhibit an average tensile strength of 8.4 GPa for a 5 mm tested length, and an average elastic modulus of 581 GPa. These results indicate that SiC whiskers posses significant potential as short-fiber reinforcement elements in ceramic matrix composites. DOE

N85-20026# Oak Ridge National Lab., Tenn.
ULTRASONIC CHARACTERIZATION OF ADVANCED COMPOSITE FLYWHEELS

W. A. Simpson, Jr. and R. W. McClung Aug. 1984 80 p refs
(Contract DE-AC05-84OR-21400)
(DE85-000158; ORNL/TM-9046) Avail: NTIS HC A05/MF A01

Energy storage flywheels fabricated of S2 glass-epoxy composite were studied to determine the behavior of the ultrasonic properties as a function of strain history and to identify possible predictors of incipient failure. Tensile specimens of the flywheel material were loaded uniaxially, and the ultrasonic properties were measured as a function of strain. Finished flywheels were similarly tested at various stages during cyclic spin testing; in addition, the polar backscattering intensity as a function of fatigue cycle was recorded. The velocities are excellent indicators of the maximum strain incurred at each point of the flywheel, and the attenuation delineates the region in which the stress is high enough to initiate microcracking in the matrix. DOE

N85-20027# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction des Materiaux.
FATIGUE-CREEP INTERACTION IN + OR - 45 DEG CARBON-RESIN COMPOSITES Final Report [INTERACTION FATIGUE-FLUAGE DANS LES COMPOSITES CARBONE/RESINE + OU - 45 DEG]
J. P. Favre, P. Sigety, and C. Marais Mar. 1984 59 p refs In FRENCH
(Contract DRET-83.34.133)
(ONERA-RT/40/7086/M) Avail: NTIS HC A04/MF A01

The relation between matrix characteristics and fatigue behavior of an eight layer carbon-resin composite was investigated in load, tensile, and tensile-compression tests. Results show that crack propagation and viscoelastic deformation are involved in fatigue, but it is not possible to decide which mechanism is the more important. Author (ESA)

N85-20052# Joint Publications Research Service, Arlington, Va.
EVALUATION OF RESIDUAL STRESS IN LAMINATED METALLIC COMPOSITES Abstract Only
N. F. Kazakov, A. V. Sergeyev, N. I. Stepanova, and A. N. Kharitonova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 12-13 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 85-88 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20053# Joint Publications Research Service, Arlington, Va.
THEORETICAL AND EXPERIMENTAL STUDY OF CRACK RESISTANCE AND MACROCRACK GROWTH RATE IN ORGANIC FIBER REINFORCED PLASTIC UNDER PURE SHEAR CONDITION Abstract Only
G. F. Zaytsev and K. V. Kaykov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1958 p 13 Transl. into ENGLISH from Mekhan. Kompozitnkyk Mater. (USSR), no. 1, Jan. - Feb. 1984 p 149-152 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20054# Joint Publications Research Service, Arlington, Va.
PREDICTING STABILITY OF FULL-SCALE COMPOSITE CONSTRUCTIONS OF THE BASIS OF STIFFNESS Abstract Only
G. G. Kartashov, S. I. Tkachenko, and O. A. Komarova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1985 p 14 Transl. into ENGLISH from Mekhan. Kompozitnkyh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 124-130 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20055# Joint Publications Research Service, Arlington, Va.
INITIAL FRACTURE STAGES OF ORTHOGONALLY REINFORCED COMPOSITE MATERIAL Abstract Only
Z. T. Upitis, I. V. Buylis, U. E. Krauya, and V. I. Kulik *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 14 Transl. into ENGLISH from Mekhan. Kompozitnykh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 60-66 Original language document was announced in IAA as A84-26340 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20056# Joint Publications Research Service, Arlington, Va.
STRENGTH PROPERTIES OF UNIDIRECTIONALLY REINFORCED HYBRID COMPOSITES Abstract Only
R. D. Maksimov, E. Z. Plume, and V. M. Ponomarev *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 15 Transl. into ENGLISH from Mekhan. Kompozitnykh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 35-41 Original language document was announced in IAA as A84-26340 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20057# Joint Publications Research Service, Arlington, Va.
HIGH-STRENGTH COMPOSITE MATERIALS FOR AIRCRAFT, BODY ARMOR Abstract Only
V. Dovidenas *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 15 Transl. into ENGLISH from Komsomolskaya Pravda (USSR), 12 May 1984 p 3 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20059# Joint Publications Research Service, Arlington, Va.
EVALUATION OF FEATURES OF REINFORCING FIBERS BY TESTING BUNDLES Abstract Only
S. S. Abramchuk, A. F. Yermolenko, and V. D. Protasov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 16 Transl. into ENGLISH from Mekhan. Kompozitnykh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 3-7 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20091# Joint Publications Research Service, Arlington, Va.
EFFECT OF MACROSTRUCTURE ON DURABILITY OF POLYCRYSTALLINE GRAPHITE Abstract Only
A. S. Kotosonov, I. Ya. Levintovich, V. I. Volga, and N. F. Kaluzhskikh *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 60 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 2, Feb. 1984 p 50-52 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20184# Joint Publications Research Service, Arlington, Va.
SEP OF FRANCE MANUFACTURES ITS FIRST SILICON CARBIDE FIBERS
Alain Perez *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 1-2 Transl. into ENGLISH from Ind. and Tech. (Paris), 1 Oct. 1984 p 25 (For primary document see N85-20183 11-31)
Avail: NTIS HC A05/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-20028# Princeton Univ., N. J. Dept. of Chemistry.
DYNAMICAL STUDIES OF MOLECULAR SYSTEMS Progress Report, 1 Feb. - 18 Oct. 1984
H. Rabitz 1984 7 p refs
(Contract DE-AC02-76ER-02542)
(DE85-003053; DOE/ER-02542/3) Avail: NTIS HC A02/MF A01

The general areas of collision dynamics and chemical kinetics were investigated. Research on the following topics was pursued: average wavefunction method for gas-surface scattering; structural analysis of phase space trajectories; sensitivity analysis of

combustion systems; determining equations for derived sensitivity gradients and densities; sensitivity analysis of limit cycles with application to the brusselator; and parameter space mapping of first order ordinary differential equations. DOE

N85-20029# Southwest Research Inst., San Antonio, Tex.
PHOTOSYNTHESIS OF AMMONIA
W. A. Mallow 24 Sep. 1984 36 p refs
(Contract DE-AC03-83SF-11939)
(DE85-001482; DOE-SF-11939/T1) Avail: NTIS HC A03/MF A01

The technical feasibility of producing ammonia using an technique of combining air, water and sunlight was demonstrated. The technique involves passing moist air over a catalyst-doped, open-celled silica foam bed illuminated by concentrated sunlight. A catalytic reaction results in small amounts of ammonia. Testing of a pilot (small scale) ammonia production system located on the roof of a Southwest Research Institute (SwRI) Laboratory located in San Antonio, Texas is described. Thirty-one test were conducted in the roof top facility. A number of important process parameters were evaluated. The ammonia production rate from these tests varied from several milligrams per hour to a few micrograms per hour. The tests showed that ammonia production was possible although the yields were relatively low. Several aspects of the process could be improved to increase the yield rates. Specifically, better techniques for illuminating the catalyst with concentrated sunlight and for providing moisture at the catalyst surface should enhance the ammonia production rate. DOE

N85-20030# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
STUDIES OF THE KINETICS AND MECHANISMS OF AMMONIA SYNTHESIS AND HYDRODESULFURIZATION ON METAL SINGLE CRYSTAL SURFACES
A. J. Gellman, M. Asscher, and G. A. Somorjai Jul. 1984 14 p refs Presented at the 188th Meeting of the Am. Chem. Soc., Philadelphia, 26-31 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE85-001650; LBL-18289; CONF-840805-24) Avail: NTIS HC A02/MF A01

The ammonia synthesis reaction over Fe and Re single crystal surfaces was studied together with the hydrodesulfurization of thiophene over the Mo(100) single crystal surface. The studies were performed using uhv surface science tools with the capability of exposing the surfaces to high pressure, high temperature reaction conditions. The ammonia synthesis reaction was shown to be extremely sensitive to surface structure on both Fe and Re, favoring surfaces with a rough or open topography. The HDS reaction on the Mo(100) surface was shown to be similar to that on MoS2 and appear to proceed via a reaction path that does not produce as strong a Mo-S bond as an intermediate species. DOE

N85-20031# Northwestern Univ., Evanston, Ill. Dept. of Engineering Science and Applied Mathematics.
RESEARCH IN NONLINEAR PROBLEMS OF ENERGY: INFORMAL TECHNICAL REPORT Progress Report
B. J. Matkowsky 1984 20 p
(Contract DE-AC02-78ER-04650)
(DE85-001529; DOE/ER-04650/T1) Avail: NTIS HC A02/MF A01

Research on the applications of bifurcation and stability theory was conducted, with emphasis on combustion and flame propagation, in particular the transition from laminar to turbulent flame propagation. Publications are listed and summaries of the results are presented. DOE

N85-20032# National Bureau of Standards, Washington, D.C. Center for Fire Research.
FLAME SPREAD ON COMBUSTIBLE SOLAR COLLECTOR GLAZING MATERIALS Final Report
E. Braun and P. J. Allen Jul. 1984 62 p refs
(Contract DE-AI01-76PR-06010)
(DE85-002598; NBSIR-84-2887) Avail: NTIS HC A04/MF A01

The use of ASTM D635 and associated criteria as an evaluation method for solar collector glazings was investiated. Four materials commonly used in solar collector applications were evaluated by ASTM D635. Four other test methods were used to characterize the glazing materials as to ignition, flame spread, and heat release rate. These results were compared to large scale fire tests of these materials. Based on the large scale tests, it was found that ASTM D635 produced test results that were not consistent with those obtained from the large scale tests. Good agreement was found between the rank ordering of the large scale tests and heat release rate and ignition properties as measured in the cone calorimeter and modified ISO test. DOE

N85-20033# Kentucky Univ., Lexington.
FUNDAMENTAL STUDY OF CATALYSTS USING LASER RAMAN, INFRARED, AUGER ELECTRON SPECTROSCOPY AND LOW ENERGY ELECTRON DIFFRACTION Final Report, 7 Jun. 1979 - 31 May 1984
E. B. Bradley and K. A. Arunkumer 1984 12 p refs
(Contract DE-AS05-79ER-10447)
(DE85-001813; DOE/ER-10447/4) Avail: NTIS HC A02/MF A01

This research has covered the areas of: (1) surface laser Raman spectroscopy, (2) LEED (low energy electron diffraction), (3) auger spectroscopy, and (4) thermal desorption spectroscopy. These techniques were used to study structure and description of simple molecules adsorbed on nickel and cobalt crystals. Infrared spectroscopy was used to check gas purity. Greatest emphasis was given to surface laser Raman spectroscopy because of its potential to become an important addition to the arsenal of surface probes. DOE

N85-20034# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRON OXIDATION OF GRAPHITE BY FLUOROSPECIES
G. L. Rosenthal Sep. 1984 114 p refs
(Contract DE-AC03-76SF-00098)
(DE85-001196; LBL-18367) Avail: NTIS HC A06/MF A01

The fluoride-ion affinity (A sub F(-)) of phosphorus pentafluoride was determined to be 100 kcal/mole from the heats of reaction of the Lewis bases SF4 and ClO2F with PF5 near room temperature. The fluoride-ion affinity of boron trifluoride was determined to be 92 kcal/mole from the heat of reaction of ClO2F with BF3. The crystal structure of ClO2BF4 was determined and a precise lattice energy was calculated from this structure and used to determined A sub F(-). Both PF5 and BF3 were found to react with graphite in the presence of fluorine gas to yield a variety of non-stoichiometric compounds. The fluoride-ion affinity of silicon tetrafluoride is not known, but it does not react with graphite and F2 except at high pressures. These and previous results suggested a threshold in oxidizing power of intercalating species below which the oxidative intercalation reaction would not occur. The reduction of C sub x PF6 by PF3 proved that the reaction is thermodynamically controlled to some extent. The displacement of PF5 in C sub x PF6 by BF3 (with a smaller A sub F(-) suggested that two BF3 molecules may have a larger fluoride-ion affinity than one PF5 and that B2F7(-) may be a stable anion in graphite. DOE

N85-20035# Environmental Protection Agency, Las Vegas, Nev.
INTERIM PROTOCOL FOR THE AUTOMATED ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/FOURIER TRANSFER INFRARED (GC/FT-IR) SPECTROMETRY Technical Report, Oct. 1983 - Jul. 1984
D. F. Gurka Oct. 1984 44 p refs
(PB85-115186; EPA-600/4-84-081) Avail: NTIS HC A03/MF A01 CSCL 07D

The application of gas chromatography/Fourier transform infrared (GC/FT-IR) data to regulatory decisions requires the availability of validated analytical protocols. Such protocols are necessary for the generation of reliable analytical data. A GC/FT-IR protocol is described which is applicable to the determination of semivolatile organic compounds in wastewater, soils, sediments

and solid wastes. The protocol is designed for the high throughput automated analysis of multicomponent environmental and hazardous waste extracts. Automated packed column GC/FT-IR identification limits are approximately a factor of five higher than the corresponding capillary GC/FT-IR values. GRA

N85-20036# Texas A&M Univ., College Station.
PHOTOELECTROCHEMICAL REDUCTION OF CARBON DIOXIDE Final Report
J. O. Bockris, I. Taniguchi, and B. Aurian-Blajeni Aug. 1984 48 p refs Sponsored by Gas Research Inst.
(PB85-129054; GRI-84/0099) Avail: NTIS HC A03/MF A01 CSCL 07D

Photoelectrochemical reduction CO2 to CO was carried out at p-type CdTe photoelectrode in N, N-dimethylformamide solutions containing 0.1M tetrabutyl ammonium perchlorate and 1 to 10% water. This is the first example of photoelectrochemical formation of CO using a semiconductor electrode without any catalyst on the electrode surface or a mediator in solution. The overpotential for CO2 reduction is decreased to 1.2V compared to the overpotential at metal electrodes (2.0V). It was observed that ammonium ion is a catalytic mediator for the CO2 reduction. The efficiency of CO2 reduction increases because H2 evolution is suppressed. Coating the electrodes with polymers such as polyaniline decreases the overpotential. Fourier transform infrared spectroscopy of the adsorbed species during the photoassisted reduction of CO2 at various bias potentials strongly suggest that CO2 reduction involves adsorption and formation of anion radical of CO2 on the surface of p-type CdTe. GRA

N85-20037# Research Triangle Inst., Research Triangle Park, N.C.
COMPARATIVE EVALUATION OF GC/MS (GAS CHROMATOGRAPHY/MASS SPECTROMETRY) DATA ANALYSIS PROCESSING Final Report
Nov. 1984 168 p refs
(Contract EPA-68-02-3235)
(PB85-125664; EPA-600/3-84-105) Avail: NTIS HC A08/MF A01 CSCL 07D

Mass spectra obtained by fused silica capillary gas chromatography/mass spectrometry/data system (GC/MS/DS) analysis of mixture of organic chemicals adsorbed on Tenax GC cartridges was subjected to manual and automated interpretative techniques. Synthetic mixtures were prepared to simulate the following design effects: (1) the occurrence of similar or dissimilar overlapping mass spectra from two or more constituents present in unresolved gas chromatographic peaks; (2) the occurrence of similar and dissimilar proportions (concentrations) of unresolved components in as chromatographic peaks; and (3) the presence of different chemical classes in a mixture. Environmental samples from seven different geographical areas in the Continental U.S. were analyzed. Using synthetic mixtures the interpretative methods evaluated for accuracy were: (1) manual (skilled interpretor); (2) Incos data software; (3) mass spectra Fourier transformed/search software; and (4) an RTI mass spectral search system. GRA

N85-20038# Dow Corning Corp., Midland, Mich.
INVESTIGATION OF STRUCTURE-PERMEABILITY RELATIONSHIPS OF SILICONE POLYMER MEMBRANES Annual Report, Oct. 1983 - Sep. 1984
C. L. Lee, S. A. Stern (Syracuse Univ., N.Y.), and J. E. Mark (Cincinnati Univ., Ohio) Oct. 1984 124 p refs
(Contract GRI-5082-260-0666)
(PB85-148476; GRI-84/0210) Avail: NTIS HC A06/MF A01 CSCL 07C

Synthesis of polymers at Dow Corning were almost completed except the (phiPrSiO)x. Most of the determination of physical properties such as density, compressibility, Tg, expansion coefficient, cohesive density and X-ray diffraction were also completed. Preliminary economic evaluation of oxygen enrichment of air has been carried out and iso-cost curves as a function of gas premeability and gas selectivity have been obtained. Gas permeability data obtained at Syracuse University indicates that an increase in the size of the side-group of silicone polymer chains causes a decrease in the gas permeability with a concomitant increase in gas selectivity. However, if the side-groups have a special affinity toward specific penetrant molecules, the polymers could exhibit both high permeability and gas-selectivity. GRA

N85-20068# Joint Publications Research Service, Arlington, Va.
THERMOPHYSICAL PROPERTIES OF POROUS FIBER MATERIALS Abstract Only
A. G. Kostornov and L. G. Galstyan *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 27 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 3, Mar. 1984 p 88-92 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20199# Joint Publications Research Service, Arlington, Va.
THERMOPHYSICAL PROPERTIES OF MATTER
In its China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 11-12 Transl. into ENGLISH from Ziran Zazhi (China), no. 1, 1984 p 28-29 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

N85-20810# Joint Publications Research Service, Arlington, Va.
DIFFUSION SEPARATION OF REACTING GAS MIXTURES Abstract Only
Ya. A. Buyevich and I. V. Kirnos *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 14 Transl. into ENGLISH from Inzhenerno-Fizicheskiy Zh. (USSR), v. 46, no. 6, Jun. 1984 p 922-930 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-20039 BAJ Vickers Ltd., Banwell Weston-super-Mare (England).
EVALUATION OF 7010 ALUMINIUM ALLOY EXTRUDED TUBE IN THE T76 CONDITION
T. S. O. OConnell Apr. 1984 23 p refs
(Contract PERME-RME-1/11/624)
(BR-92019; TR-1005) Avail: Issuing Activity

The properties of finned extruded 7010 aluminum alloy tubes given two alternative duplex aging treatments were assessed. Little difference is found between the effects of the two treatments. In both cases improvement in stress corrosion resistance is found compared with earlier results from T6 material, with no apperent loss of tensile properties. For applications requiring tensile strength > 600 MPa, duplex aging to the T76 condition is recommended. However, protection from corrosive environments is necessary to avoid the possibility of stress corrosion cracking or exfoliation. Author (ESA)

N85-20040*# Bell Aerospace Co., Buffalo, N. Y. Electroforming Operations Dept.
STUDY OF HIGH PERFORMANCE ALLOY ELECTROFORMING Monthly Technical Progress Narrative Report, 28 Jan. - 22 Feb. 1985
G. A. Malone 11 Mar. 1985 6 p
(Contract NAS8-35817)
(NASA-CR-175494; NAS 1.26:175494; MTPNR-14) Avail: NTIS HC A02/MF A01 CSCL 11F

More panels electroformed with intentional variations of pulse plating parameters are being made. Pulse plating frequency was noted to have a significant effect regarding mechanical properties. The use of a high pulse frequency (assuming fixed duty cycles) results in an increase in ductility and a decrease in ultimate and yield strengths. Electroforming to intermediate frequencies is being done to obtain the best possible combination of ductility and

strength. Results of some tests from high frequency specimens are tabulated. R.J.F.

N85-20041*# Michigan Technological Univ., Houghton.
A STUDY OF INTERDIFFUSION IN BETA + GAMMA/GAMMA + GAMMA PRIME Ni-Cr-Al M.S. Thesis. Final Report
Lawrence A. Carol Feb. 1985 191 p refs
(Grant NAG3-244)
(NASA-CR-174852; NAS 1.26:174852) Avail: NTIS HC A09/MF A01 CSCL 11F

Ternary diffusion in the NiCrAl system at 1200 C was studied with beta + gamma/gamma + gamma prime infinite diffusion couples. Interdiffusion resulted in the formation of complex, multiphase diffusion zones. Concentration/distance profiles for Cr and Al in the phases present in the diffusion zone were measured after 200 hr. The Ni-rich portion of the NiCrAl phase diagram (1200 C) was also determined. From these data, bulk Cr and Al profiles were calculated and translated to diffusion paths on the ternary isotherm. Growth layer kinetics of the layers present in the diffusion zone were also measured. B.G.

N85-20042*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RAPIDLY SOLIDIFIED NiAl AND FeAl
Darrel J. Gaydosh and Martin A. Crimp 1984 10 p refs
(NASA-TM-86941; E-2289; NAS 1.15:86941) Avail: NTIS HC A02/MF A01 CSCL 11F

Melt spinning was used to produce rapidly solidified ribbons of the B2 intermetallics NiAl and FeAl. Both Fe-40Al and Fe-45Al possessed some bend ductility in the as spun condition. The bend ductility of Fe-40Al, Fe-45Al, and equiatomic NiAl increased with subsequent heat treatment. Heat treatment at approximately 0.85 T (sub m) resulted in significant grain growth in equiatomic FeAl and in all the NiAl compositions. Low bend ductility in both FeAl and NiAl generally coincided with intergranular failure, while increased bend ductility was characterized by increasing amounts of transgranular cleavage fracture. Author

N85-20043*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE RESPONSE OF COBALT-FREE UDIMET 700 TYPE ALLOY TO MODIFIED HEAT TREATMENTS
Frederic H. Harf 28 Feb. 1985 27 p refs Presented at the 114th Ann. Meeting of the Am. Inst. of Mining, Met. and Petrol. Engr., New York, 24-28 Feb. 1985
(NASA-TM-86942; E-2335; NAS 1.15:86942) Avail: NTIS HC A03/MF A01 CSCL 11F

A superalloy based on Udimet 700, in which all of the cobalt was replaced by nickel, was prepared from hot isostatically pressed prealloyed powders. This material was given various heat treatments consisting of partial solutioning and aging in a sequence of four different temperatures. Comparisons were made of microstructures and mechanical properties. Best results were obtained by partially solutioning at 1145 deg C and aging through a sequence of 870, 1030, 650 and 760 deg C. This heat treatment also provided significantly improved properties for wrought material of the same composition. The results suggest that cobalt free Udimet 700 should be considered as a substitute for Udimet 700 with the standard 17 percent cobalt content. R.J.F.

N85-20044# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MATERIALS SCIENCE AND METALLURGY Abstracts Only
18 Jul. 1984 70 p Transl. into ENGLISH from various Russian articles
(JPRS-UMS-84-005) Avail: NTIS HC A04/MF A01

Developments in materials science and metallurgy are reported in this U.S.S.R. report. Topics covered include: (1) aluminum and its alloys; (2) nondestructive testing; (3) coatings; (4) composite materials; (5) corrosion; (6) energy effects; (7) powder metallurgy; (8) refractory materials; (9) steels; (10) titanium; and (11) welding. For individual titles, see N85-20045 through N85-20091.

N85-20045# Joint Publications Research Service, Arlington, Va.
EFFECT OF INGOT STRUCTURE OF FAILURE DUCTILITY OF PRESSED SEMIFINISHED PRODUCTS OF HIGH-DURABILITY ALUMINUM ALLOYS Abstract Only
G. I. Eskin, G. S. Neshpor, B. A. Kopeliovich, S. I. Borovikova, A. A. Armyagov, L. B. Ber, and A. D. Petrov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 1 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 2, Feb. 1984 p 25-28 Original language document was announced in IAA as A84-24764 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The hereditary effect of the subdentritic structure of ingots on the structural strength of hot pressed strips of V96ts1, a high strength alloy of the system Al-Zn-Mg-Cu, is investigated experimentally. It is shown that the use of ingots with a fine grained subdendritic structure and fine secondary (intermetallic) phases makes it possible to improve the fracture toughness, and consequently the structural strength, of semifinished products of V96ts1. The subdendritic structure also improves the workability of the alloy, making it possible to obtain hot pressed products of complex shapes at higher production rates. V.L. (IAA)

N85-20046# Joint Publications Research Service, Arlington, Va.
STRUCTURE-PHASE STATE AND PROPERTIES OF HIGH-DURABILITY VAL8 ALLOY Abstract Only
N. S. Postnikov, A. S. Shpigel, G. S. Lukyanov, and L. I. Laktionova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 1-2 Transl. into ENGLISH from Met. i Term. Obrabotka Met. (Moscow), no. 3, Mar. 1984 p 51-53 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The present article considers means of choosing alloying elements and their impact on overall properties of the resulting alloys by study of an Al-Si alloy with 8% silicon and varying amounts of Mg, Cu, Zn, Be, Ti and Zr. Analysis of copper and zinc by a microsounding method showed zinc to be in solid solution and independent of thermal processing, while the maximum copper content in solid solution with minimum amounts in other phases came with 1% zinc content in the alloy. These two elements led to the greatest increase in durability with the least change in relative stretching. A mathematical planning process was developed for showing composition property relationships. Tests of other combinations of alloying elements showed various minor phase variations, the presence of oxidants around silicon crystals, and the stabilizing effect of beryllium on alloy oxidation. The basic properties of the VAL8 alloy of durability, viscosity, hydrodurability, plasticity, etc., were maintained. Author

N85-20047# Joint Publications Research Service, Arlington, Va.
MECHANISM AND PATTERN OF FATIGUE CRACK GROWTH IN ALUMINUM ALLOYS Abstract Only
A. A. Shanyavskiy and S. A. Kunavin *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 3 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Met. (Moscow), no. 2, Mar. - Apr. 1984 p 159-163 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Fatigue crack growth in aluminum alloys is analyzed on the basis of the fiber model (ASTM STP, 486, 1981), specifically the second stage of crack opening in zone C (crevices) after longitudinal shear has initially built up in zone P (pseudocrevices) and before macroplastic instability will finally occur in zone PC (pits and crevices). The self similar discrete process of crack growth jumps in successive loading cycles is described by the relation delta sub i/delta sub i sub + sub 1 = delta sup1/m, with the universal fracture constant delta = 0.22 and m = 4, 8, 16, 32 for aluminum alloys. Also taken into account is the transition from stage 1 to stage 3. An experimental study made of D16T aluminum alloy cracking within the threshold range, with morphological and microstructural examination under a KVIK-100 microscope has yielded quantitative data on crack increments as well as on corresponding threshold stress intensity coefficients delta K sub 1, thr below which no cracking occurs and delta K sub 1 (N-1) for

transition from stage 1 to stage 3. It was possible to plot the cracking pattern on a microrelief diagram for this particular aluminum alloy. B.W.

N85-20048# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF AK18 ALLOY PRODUCTION TECHNOLOGY BASED ON ELECTROTHERMIC SILUMIN Abstract Only
B. I. Karpov, M. N. Mikhaylova, V. M. Cheltsov, K. P. Lebedev, and A. I. Baykina *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 3 Transl. into ENGLISH from Tsvetn. Met. (Moscow), no. 3, Mar. 1984 p 50-52 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

A technology for the manufacture of the piston alloy AK18 with high iron content with optimal modification was developed. The initial charge materials included alloy AK18 (about 18% Si, 1.1% Mg, 0.5% Fe, 0.1% Ti, 0.2% Zr, 0.5% Cu and 1% Ni) produced from electrothermic silumin, an aluminum iron (20% Fe) master alloy and type KRI crystalline silicon, introduced to maintain a constant silicon content. The alloys were manufactured in a 30 kW resistance furnace in graphite chamotte crucibles, refined with hexachloroethane 0.5% of the charge mass, introduced in aluminum foil. Some of the alloys were preliminarily refined with sodium containing salts. The influence of the following modifying additives was studied: CuP, CuP+S, CaC2, SiC, a patent additive consisting of 20% red phosphorus, 70% potassium chloride and 10% potassium fluorotitanate. Mechanical properties were determined on specimens poured into a cast iron chill mold after heat treatment. The results showed that preliminary refining with sodium containing salts has no significant influence on the properties studied. B.W.

N85-20049# Joint Publications Research Service, Arlington, Va.
ESTIMATING DEFORMABILITY UPON PRESSING OF ALUMINUM ALLOYS BASED ON RESULTS OF MECHANICAL TESTING Abstract Only
V. V. Zakharov and Yu. N. Kukushkin *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 3-4 Transl. into ENGLISH from Tsvetn. Met. (Moscow), no. 3, Mar. 1984 p 79-81 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Experimental data are presented representing the correlation between certain criteria suggested for use in estimating deformability and one of the major indices of deformability of aluminum alloys during pressing, the maximum permissible flow rate. Exceeding this flow rate causes defects on the surface of pressed semifinished goods, primarily cracks. The maximum permissible flow rate is a structurally sensitive characteristic, strongly depending upon chemical composition of the alloys and the structure of the pressed blanks. It is determined by the appearance of transverse cracks on the surfaces of pressed semifinished goods. Based on a plan of crack formation suggested, factors can be distinguished which determine the critical flow rate. They include the difference between the temperature at which cracks begin to form and the temperature to which the blank is heated before pressing, as well as the mean rate of temperature rise in the pressed alloy during the pressing itself. Author

N85-20050# Joint Publications Research Service, Arlington, Va.
STUDY OF PHASE COMPOSITION OF Al-B PLASMA COATINGS Abstract Only
Dkh. A. Avlokhashvili, D. L. Gabuniya, V. G. Zilberg, D. M. Karpinos, I. A. Stashevskaya, F. N. Tavadze, G. F. Tavadze, and G. V. Tsagareyshvili *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1985 p 7 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 3, Mar. 1984 p 68-70 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Aluminum specimens with a coating consisting of aluminum plus boron applied in air were studied to determine the possibility of applying coatings by plasma methods. Studies were made of sections prepared from central and peripheral portions of the plasma coated specimens. X-ray studies were performed using Cu radiation, nickel filter. Localized X-ray spectral analysis of specimens was also performed. It was concluded that during plasma atomization of the Al-B composite the boron powder underwent no structural changes. The plasma atomization method has the advantage of possibility of preparation and application of mixtures with various percent contents of the components as coatings. Author

N85-20051# Joint Publications Research Service, Arlington, Va.
NEW METHOD FOR STUDYING SURFACE CRACK GROWTH IN LAMINATED POLYMER COMPOSITE MATERIALS Abstract Only **c27**
M. E. Chaplya and N. M. Gvozcyuk *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 12 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (USSR), v. 20, no. 1, Jan. - Feb. 1984 p 84-87 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The durability of laminated polymer composite materials has encouraged wide use as well as numerous scientific studies, but most have concentrated on samples 10 mm+ in thickness. Samples less than 5 mm in thickness were investigated to develop a methodology for studying crack resistance. Three layer samples with initiated flaws were stretched as lengthening of the sample and crack expansion were recorded. The samples consisted of a homogeneous center laminate with FMMA outer layers attached with related polymerizing glues. The apparatus used and the course of stretching and cracking is summarized. Analysis of the fracture surface indicated a process like that of organic glasses, with a failure focus and a mirror zone, the development of which is a key feature in determining cracking direction and nature. The dimensions of the fissure apparently depend on the precritical growth of the crack in the first laminate. Critical coefficients vary, with resistance decreasing when various additives are included in the test fiberglass sheets. Temperature of polymerization is not as important as the additives used. Author

N85-20052# Joint Publications Research Service, Arlington, Va.
EVALUATION OF RESIDUAL STRESS IN LAMINATED METALLIC COMPOSITES Abstract Only **c24**
N. F. Kazakov, A. V. Sergeyev, N. I. Stepanova, and A. N. Kharitonova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 12-13 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 85-88 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

In welding, cooling often leads to loss of form or delamination. An analytical approach to resolving such problems is presented. Calculations were based on a linear tempering process, with cooling from the welding temperature to 293 K. The calculated values were then tested experimentally with a trimetal of 12Ch-18Ni10Ti steel-copper-molybdenum and a VT10 titanium-aluminum bimetal, with thicknesses of components in the bimetal at 2, 0.5 and 2 mm (forming a sandwich) and with nine 0.5 mm layers in the trimetal. Temperature regimes that reduce residual stress after welding were determined from experimental data. For the trimetal, the temperature range was 500 to 700K. B.W.

N85-20053# Joint Publications Research Service, Arlington, Va.
THEORETICAL AND EXPERIMENTAL STUDY OF CRACK RESISTANCE AND MACROCRACK GROWTH RATE IN ORGANIC FIBER REINFORCED PLASTIC UNDER PURE SHEAR CONDITION Abstract Only **c24**
G. F. Zaytsev and K. V. Kaykov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1958 p 13 Transl. into ENGLISH from Mekhan. Kompozitnkyk Mater. (USSR), no. 1, Jan. - Feb. 1984 p 149-152 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Dealing with highly dangerous cracks in design components requires evaluation during manufacture as well as later monitoring. Pure lateral shear from the reinforced structure, initial length and orientation of cracks are discussed. A two-parameter mathematical

model was developed to illustrate the linear mechanics of failure with correction in the pre-failure crack surfaces. Failure calculations were made using a consecutive approximation method, and a photorefractory coating method was used to evaluate the stressed state in the organotextolite layer during lateral shear. The coating was an epoxy resin with metaphenyldiamine hardener. The experimental data made it possible to perfect the mathematical models and make them much more accurate. Results showed that the spread of cracks is dependent on structure type and orientation relative to the basic reinforcing direction. B.W.

N85-20054# Joint Publications Research Service, Arlington, Va.
PREDICTING STABILITY OF FULL-SCALE COMPOSITE CONSTRUCTIONS OF THE BASIS OF STIFFNESS Abstract Only **c24**
G. G. Kartashov, S. I. Tkachenko, and O. A. Komarova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1985 p 14 Transl. into ENGLISH from Mekhan. Kompozitnkyh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 124-130 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The range of technical features of large composite designs requires careful experimental study before use in order to establish technical and economic parameters. The present article reports on calculation of durability for various composite designs and on prediction error of load ratings. Simple models were developed in order to compare calculated and experimental values for hinged orthotropic and sloping cylindrical panel designs. Descriptions are given of a channel, a conical shell, and a cylindrical shell. The study shows that the use of the stiffness factor selected permits sufficiently accurate prediction of components made of composite materials for durability testing. The use of two-component prediction reduced prediction error by 2 to 3.7 times compared to a single-component formula. In some cases, a layer-by-layer evaluation was required. Author

N85-20055# Joint Publications Research Service, Arlington, Va.
INITIAL FRACTURE STAGES OF ORTHOGONALLY REINFORCED COMPOSITE MATERIAL Abstract Only **c24**
Z. T. Upitis, I. V. Buylis, U. E. Krauya, and V. I. Kulik *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 14 Transl. into ENGLISH from Mekhan. Kompozitnykh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 60-66 Original language document was announced in IAA as A84-26340 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

A review of various approaches to the problem of fracture in cross-wound composites is presented, and an orthogonally reinforced glass-carbon composite tubular specimen in tension along its generator line is investigated. Mechanoluminescence (ML) was observed to be a consequence of crack formation in hybrid composites. The ML method, as well as tensometry for specific cases, may be used to locate the loss of continuity in composites subjected to uniaxial loading. The ML method alone is used to register crack initiation for a hybrid composite under combined loading in the plane-stressed state. J.N. (IAA)

N85-20056# Joint Publications Research Service, Arlington, Va.
STRENGTH PROPERTIES OF UNIDIRECTIONALLY REINFORCED HYBRID COMPOSITES Abstract Only **c24**
R. D. Maksimov, E. Z. Plume, and V. M. Ponomarev *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 15 Transl. into ENGLISH from Mekhan. Kompozitnykh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 35-41 Original language document was announced in IAA as A84-26340 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Several types of unidirectional three-component composites, including plastics reinforced with organic and glass fibers, organic and carbon fibers, organic and boron fibers, and carbon and glass fibers, with various ratios of volumetric fiber content, were experimentally investigated. A relationship between short-term strength and the fiber type and content is established, and the possibility of describing the strength of the composites in the plane-stressed state using a relationship for the tensor-polynomial criteria is demonstrated. A relationship was obtained from experimental data between the tensor components of surface strength and the volumetric fiber content ratios. J.N. (IAA)

N85-20057# Joint Publications Research Service, Arlington, Va.
HIGH-STRENGTH COMPOSITE MATERIALS FOR AIRCRAFT, BODY ARMOR Abstract Only **c24**
V. Dovidenas *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 15 Transl. into ENGLISH from Komsomolskaya Pravda (USSR), 12 May 1984 p 3 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Progress in the USSR and abroad in applications of composite materials for transportation and industry is reported. Particular attention is devoted to the technical and economic advantages of extra-strong and lightweight glass-reinforced and carbon-fiber-reinforced plastics which have been developed for aircraft, spacecraft, ships and motor vehicles. Composite materials are being designed for the production of such key parts of aircraft as airplane fuselage frames and stern-propeller shafts of helicopters. Specific information is related on the use of composites in glider plane construction. A record-setting glider, the Letuva, which was first built in 1972, is said to be made almost entirely of composite materials. Wing spars up to 12 meters long for the Letuva are manufactured from a carbon-reinforced plastic at the Prenay Sports Aviation Experimental Plant, which has pioneered the introduction of all-plastic reinforced structures in the USSR. The plant has special units for hardening composites at high pressures and temperatures. Also mentioned is the use of Kevlar fibers in bulletproof vests. B.W.

N85-20058# Joint Publications Research Service, Arlington, Va.
METHOD OF CONSTRUCTING DIAGRAM OF BIMETAL FATIGUE FAILURE Abstract Only
N. A. Makhutov, A. P. Chernyayev, and A. I. Tananov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 16 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (USSR), v. 20, no. 1, Jan. - Feb. 1984 p 104-106 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Expanded use of bi- and multi-laminate metallic compositions with complementary physicomechanical properties requires more precise evaluation of load capability with crack-type defects and prediction of useful life based on knowledge of components of the laminated material. Calculations of these dynamic fatigue failure parameters are given. Results of experimental confirmation of the theoretical values, using a bimetal St.3+12ch18Ni10T steel made by fagot rolling are presented. The tests indicated that the mathematical model data were within an acceptable 15% of the experimental findings. B.W.

N85-20059# Joint Publications Research Service, Arlington, Va.
EVALUATION OF FEATURES OF REINFORCING FIBERS BY TESTING BUNDLES Abstract Only **c24**
S. S. Abramchuk, A. F. Yermolenko, and V. D. Protasov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 16 Transl. into ENGLISH from Mekhan. Kompozitnykh Mater. (USSR), no. 1, Jan. - Feb. 1984 p 3-7 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

A model was developed to assess inequalities of fiber load, distribution of durability in the transition from one bundle to another, failure point and length variations. Mathematical formulas are presented to express the relationship between stretch tension and deformation for bundles of many fibers where loading onto individual fibers or their failure do not cause major variations. Mathematical data showed an initial non-linear segment related to unequal load initiation on fibers; length variation dispersion did not exceed 0.1%. B.W.

N85-20060# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF PLASTIC DEFORMATION ON STRUCTURAL STABILITY OF NICHROME-TUNGSTEN COMPOSITE MATERIALS Abstract Only
D. M. Karpinos, L. I. Tuchinskiy, L. R. Vishnyakov, V. P. Moroz, V. P. Dzeganovskiy, and T. N. Bondarenko *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 17 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 3, Mar. 1984 p 40-44 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Results are presented from a study of the structure of a sandwich-type unidirectional composite material obtained by hot stamping. Studies were performed on KhN60VT and KhN78T alloys reinforced with VA tungsten wire 0.1 mm in diameter. Reinforcement percentages were 28% for KhN60Vt, 24% for KhN78T. Plastic deformation by rolling caused the fibers to elongate, taking on a near elliptical shape. Studies of chromium distribution showed that in both composites during annealing the chromium concentration at the surface of the specimens decreased to 0.5-2% by mass in a layer 60 to 80 microns thick. The materials, obtained by hot stamping and subsequent plastic deformation, showed variation in the nature of diffusion interaction of the components as a function of the degree of plastic deformation. The tungsten fibers stabilized the composition of the composite, presenting obstacles to diffusion of chromium. Author

N85-20061# Joint Publications Research Service, Arlington, Va.
STRUCTURE AND PROPERTIES OF COPPER-TITANIUM-ALUMINUM COMPOSITES OBTAINED BY THERMOREACTIVE SINTERING Abstract Only
V. G. Delevi, A. A. Burkhan, V. A. Konavalov, R. K. Tkachenko, N. V. Pisarenko, and N. G. Bagno *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 17-18 Transl. into ENGLISH from Poroshkovaya Met.(Kiev), no. 3, Mar. 1984 p 53-56 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The purpose was to study the structure and properties of composites in the system Cu-Ti-Al obtained by thermoreactive sintering. Compositions were selected with constant mass content of aluminum (5%) and variable copper and titanium contents (5-60%) at intervals of 5%. Studies were performed by metallography and measurement of microhardness, X-ray phase and microscopic X-ray spectral analysis, testing for compressive and bending strength, specific impact toughness and aggregate Rockwell hardness. The process of formation of composites in the system is a diffusion process, resulting in a formation of microstructures consisting of various intermetallic compounds and resides of the initial components. As the titanium content in the composite changes, both quantitative and qualitative structural changes occur. The most homogeneous structure is that of composites with 35 to 45% Ti, the end products of which contain the minimum quantity of the initial components. Composites with 15 to 30% Ti have relatively good physical and mechanical properties. R.J.F.

N85-20062# Joint Publications Research Service, Arlington, Va.
FORCED CORROSION TESTS OF CONSTRUCTION COMPONENTS OF PASSENGER AIRCRAFT FUSELAGES Abstract Only
A. V. Karlashov, R. G. Gaynutdinov, A. M. Svintsitskiy, A. M. Voronkin, N. F. Sadkov, V. V. Voronov, and Ye. A. Krasnov *In its* USSR Rept.: Mater. Sci. and Met. (JPRS-UMS-84-005) 18 Jul. 1984 p 20 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (USSR), v. 20, no. 1, Jan. - Feb. 1984 p 92-93 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

An attempt was made to determine the nature of changes in the coefficient of corrosion acceleration as dependent on test duration for V95 aluminum used in aircraft fuselages, taking into account both atmospheric and condensational factors that can provoke delamination. Tests with 1.0 g/1 potassium dichromate and 1.0 ml/1 hydrochloric acid indicated that this solution effectively reproduced the delaminating corrosion on fuselage stringers, as measured by loss of fatigue resistance. Results showed that natural condensate cut longevity by 57% in 20 days, while the accelerated solution cut it by 74%. In the next 20 days loss of useful life decreased by an additional 10% and 4%, respectively. Thus in general, results indicated that the coefficient of forced corrosion decreased with increasing duration of testing. This factor must be considered in assessing results received in accelerated corrosion tests. R.J.F.

N85-20063# Joint Publications Research Service, Arlington, Va.
OXIDATION OF PT-7M AND OT4-1 TITANIUM ALLOYS IN AIR Abstract Only
G. G. Maksimovich, V. N. Fedirko, and A. T. Lizus *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 21 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (USSR), v. 20, no. 1, Jan. - Feb. 1984 p 87-91 Original language document was announced in IAA as A84-27863 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Experiments have been carried out on PT-7M and OT4-1 titanium alloys to investigate the effect of alloying with aluminum, zirconium, and manganese on the gas corrosion of the alloys in air and on their heat resistance at 850 C. It is shown that alloying with aluminum, while increasing the rate of scale formation at the initial stage of oxidation, decreases the solubility of oxygen in the metal. Layers of Al_2O_3 formed in the course of oxidation increase the heat resistance of the alloys. A comparison of results obtained for OT4-1, PT-7M, and Ti-2Al shows that alloying of the latter with 2 pct Zr makes the scale somewhat thicker, but also reduces the depth of the diffusion layer. Manganese is shown to increase both the rate of scale formation and the depth of the gas-saturated layer. V.L. (IAA)

N85-20064# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF PHASE COMPOSITION OF PRODUCTS OF LASER DESTRUCTION OF METALLIC SURFACES Abstract Only
V. P. Veyko, N. I. Rogovaya, and Ye. A. Tuchkova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 22 Transl. into ENGLISH from Elektron. Obrabotka Mater. (USSR), no. 1, Jan. 1984 p 51-53 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Theoretical consideration of phase structure resulting from use of a laser impulse of about ten to the minus 8th power. Mathematical formulas were prepared for heating, melting, vaporizing and removal of the melted material from the irradiated zone. After running the resulting program on a computer, experimental tests were conducted for verification with a molybdenum target and surface intensity of about 10 to the 13th power watt/square meters. The course of laser melting and vaporization indicated that the portion of liquid phase metal could exceed that of the vapor phase, while increasing laser intensity brought increased liquid phase amounts. Decreasing the impulse duration brought an increase in the general amount of products of laser destruction, while reducing the dimension of the irradiated zone sharply increased the quantity of melted metal. R.J.F.

N85-20065# Joint Publications Research Service, Arlington, Va.
RESIDUAL STRESS AFTER LASER PROCESSING Abstract Only
A. N. Grechin and V. A. Katolichuk *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 22-23 Transl. into ENGLISH from Elektron. Obrabotka Mater. (USSR), no. 1, Jan. 1984 p 29-32 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Rapid heating and cooling and phase changes during laser processing of metals produce residual surface stress. Distribution of such stress in ferrite and perlite forged irons and 45 and U10 steels with and without surface melting is discussed. Before processing, the samples were annealed at 700 C for 2 hours and treated with manganese phosphate to enhance surface absorption. Pulsed and continuous beam lasers were used. Pulsed processing

of the ferrite without melting brought compression pressure that decreased only at a depth of 0.3 mm. Such internal stress was not found in samples where the laser irradiation caused melting. Similar results came with continuous beam laser processing, and results with perlite iron were analogous but with much more extreme internal stress values. In the steels tested, the tension was not of a compression but of a tractive type, regardless of the type of laser irradiation used. Laser tempering affected deformation of samples on the basis of both the radiation procedure and the intensity of the path. Consecutive passes with the laser did not bring as great an increase in internal stress as anticipated. R.J.F.

N85-20066# Joint Publications Research Service, Arlington, Va.
STUDY OF MICROSTRUCTURE OF ALUMINUM AND COPPER ALLOYS AFTER PROCESSING WITH CONTINUOUS CO2 LASER BEAM Abstract Only
A. N. Safronov, A. G. Grigoryants, N. A. Makusheva, and A. V. Sergeyev *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 23 Transl. into ENGLISH from Elektron. Obrabotka Mater. (USSR), no. 1, Jan. 1984 p 26-29 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Structural changes in surface layers of various aluminum alloys with laser processing at 1-3 KWT, depths of 0.32 to 0.85 mm and beam width of 1.6-2.4 mm are discussed. Variations in resulting microhardness are discussed. The tempered zone that developed in iron and steel alloys after laser treatment was found lacking in the aluminum alloys tested. Impurities changed form from acute-angled and needle-shaped forms (e.g., of silicon) to globular and smooth-grained ones. With copper alloys as well as the aluminum ones, where nearly eutectic composition was found initially, microhardness was increased by 1.5 to 2 times during CO2 laser irradiation. R.J.F.

N85-20067# Joint Publications Research Service, Arlington, Va.
EXPLOSION-PROOF PROPERTIES AND HYDRAULIC RESISTANCE OF FIRE-BARRIER ELEMENTS BASED ON KNITTED METALLIC SCREENS Abstract Only c31
A. I. Elnatanov, I. I. Strizhevskiy, A. Ye. Rutkovskiy, N. S. Geyntse, V. A. Zorin, N. V. Andreyeva, A. A. Ivanchuk, and D. M. Karpinos *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 26-27 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 2, Feb. 1984 p 101-104 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Porous knitted metallic screens with relatively even pore distribution and insignificant hydraulic resistance were found useful in explosion and fire barrier applications. The use of such materials in analyzers of burning gas mixtures is discussed. Critical pressure tests were made in a 100-mm vessel divided into chambers of 0.1 and 3.51, the latter serving as the receiver in case of ignition in the smaller, and for controlled burn of the mixture. Induction receivers indicated that little transfer of combustion products occurred. Test screens with steel wire of 50 to 90 mcm diameter, with strands of 6-20 fibers of 50 mcm diameter and a combination of these, and 4 to 8 mm thickness, were covered with knitted stainless steel material of 0.4 diameters; pores were 0.5 x 0.5 mm. Results indicated that samples of 400 to 300 mcm porosity underwent significant deformation, yet still served as flame barriers. Fine wire strands were more effective than thicker ones, and rust from oxidation increased hydraulic resistance. R.J.F.

N85-20068# Joint Publications Research Service, Arlington, Va.
THERMOPHYSICAL PROPERTIES OF POROUS FIBER MATERIALS Abstract Only c25
A. G. Kostornov and L. G. Galstyan *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 27 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 3, Mar. 1984 p 88-92 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

An experimental study was performed of the combination of thermophysical properties (heat and temperature conductivity, heat capacity, coefficient of thermal expansion) of porous fiber materials. Heat conductivity was studied by a stationary comparison method, the plate method, a pulsed method based on studies of the kinetics of changes in temperature at one end surface of the specimen after a thermal impulse was applied to the other end, and the absolute method under conditions of steady heat flux along the axis of cylindrical specimens and through the wall thickness of sleeves. Heat conductivity decreased with increasing fiber diameter, as was expected. Heat conductivity changed with increasing temperature just as it changes in nonporous metals. Coefficients of thermal expansion varied with temperature in a manner which becomes understandable considering the fact that as porosity increases the distance between contacts and flexibility of elements increase, thus increasing the possibility of structural deformation in the material. Author

N85-20069# Joint Publications Research Service, Arlington, Va.
EFFECT OF SILICON AND TITANIUM PROPERTIES ON Nil-8Co9Mb5Ti STEEL Abstract Only
V. A. Kharitonov, N. I. Popova, and V. F. Shishov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 31 Transl. into ENGLISH from Met. i Term. Obrabotka Met. (Moscow), no. 3, Mar. 1984 p 42-44 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Since silicon is a harmful impurity in Ni18Co9Mb5Ti martensite-aging steel and content must be controlled, a range of 0.08% to 0.93% silicon content in tempered and aged samples of the steel was studied to determine mechanical properties. Results indicated that as silicon content increased, limits of yield and durability increased somewhat, while plasticity and especially impact strength declined with normal tempering at 820 deg C in air or water. With tempering at 1000 deg C in water, impact strength increased with added silicon in the range 0.26 to 0.93%, but remained less than impact strength with 0.08% silicon content. Granule etching intensity in a 2% HNO3 solution was in direct relation to silicon content and in inverse relation to the tempering temperature. Aged samples had markedly lesser plasticity and impact strength with higher amounts of silicon. Tempering at 1000 dec C in water had the same impact on aged samples as above. Titanium content of 0.43 to 1.65% was also tested for impact on mechanical properties. Ti content above 1.2% reduced the temperature interval of martensite conversion. R.J.F.

N85-20070# Joint Publications Research Service, Arlington, Va.
FRACTOGRAPHIC FEATURES OF TITANIUM ALLOY FATIGUE FAILURE UNDER REPEATED STATIC STRESS AND HIGH FREQUENCY VIBRATION Abstract Only
T. Yu. Yakoleva, T. S. Voznyy, and V. A. Kuzmenko *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 32 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 81-85 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

TS alpha-alloy and VT14 alpha+beta-alloy sheets tested with 500-Hz vibrations and a stretching load are discussed. Results showed a marked weakening effect with rather low-power, high-frequency vibration, but the damage was not as great as that resulting from corresponding low-frequency cyclic stress. Fractographic study of the same samples with repeated static stretch loading at 615 MPa without vibrations showed fatigue failure that was not attributable to plate shifting. Analysis of VT14 high-durability titanium alloy samples showed similar fatigue destruction with both types of loading; failure was close to quasistatic in character. Some delamination along and lateral to the rolling axis was also noted in the VT14 alloy. R.J.F.

N85-20071# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYDROGEN ON FATIGUE OF VT6 ALLOY Abstract Only
A. V. Malkov, B. A. Kolachev, M. G. Mishanova, and B. B. Bylov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 32-33 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 73-76 (For primary document see

N85-20044 11-26)
Avail: NTIS HC A04/MF A01

An attempt is made to define the effet of hydrogen on titanium alloy durability after its introduction by a thermal diffusion method with full annealing at 800 deg C for 3 hours. Microfractographic and microstructural analyses showed significant variations in the effect of hydrogen, depending on concentration. With 0.045% hydrogen by weight, an increase in cyclic durability was recorded, while at higher concentrations, the reverse was observed. Vacuum had an important impact on fatigue resistance as well. X-ray analysis showed increased amounts of the beta-phase and microdistortion of the crysalline structure as hydrogen amounts increased from 0.003 to 0.2% in the alloy. Structural changes during annealing caused changes in durability and plastic properties, which improved up to 0.045%, after which a hydride brittle phase appeared. With the higher hydrogen content, the growth of flaws increased as hydride phases reducewd adhesion between alpha-granules. The limit of hydrogen solubility in VT6 alloy was the point at which hydrides began to form and toughness began to decline. R.J.F.

N85-20072# Joint Publications Research Service, Arlington, Va.
DEPENDENCE OF MECHANICAL PROPERTIES OF LARGE VT3-1 ALLOY FORGINGS ON MICROSTRUCTURE PARAMETERS Abstract Only
B. A. Kolachev, L. S. Guskova, and M. G. Veytsman *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 33 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Met. (Moscow), no. 2, Mar. - Apr. 1984 p 126-129 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

For the purpose of more precisely classifying titanium alloys with respect to microstructure, specifically 100-300 kg large forgings of the VT3-1 alloy, mechanical tests and metallographic examination were performed on semifinished specimens after isothermal annealing. Mechanical testing covered tensile strength, fatigue of cylindrical rods in pure flexure with rotation at 6000 rpm loading speed, and toughness of notched bars in eccentric tension. Metallography included macrostructural examination of templets cut from specimens before and after mechanical treatment as well as microstructural examination of fracture surfaces after failure in each test mode. On the basis of tatistical analysis of the results, VT3-1 forgings have been classified into five structural groups. A comparative evaluation of the results, taking into account the relevant statistical distributions, reveals that the fatigue strength increases and the toughness decreases with decreasing size of alpha-phase particles. R.J.F.

N85-20073# Joint Publications Research Service, Arlington, Va.
PHASE TRANSFORMATIONS IN VANADIUM ALLOYS OF TITANIUM DURING QUENCHING AND TEMPERING Abstract Only
L. N. Guseva and L. K. Dolinskaya *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 34 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Met. (Moscow), no. 2, Mar. - Apr. 1984 p 120-125 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

An experimental study was made of phase transformation in titanium alloys with 10 to 22% vanadium during quenching and tempering. Specimens weighing 10 to 12 g were prepared from titanium iodide and vanadium by smelting in an open hearth in a helium atmosphere, with subsequent annealing and homogenization in vacuum at 900 deg C for 30 min. Quenching was done with icy water and with water at room temperature, tempering was done at 400 deg C for 150 hr. Hardness was measured with a Vickers tester; X-ray diffractometry was done in filtered radiation from a copper source using DRON-1 equipment with a scintillation counter. The periods of crystal lattices were also determined, taking into account the effect of phase diversity and dispersion as well as of stresses on the accuracy of this determination. The results, diffractograms and hardness readings taken over the entire test period, reveal that the alpha-phase formed during quenching undergoes reverse martensite transformation during aging, that omega- the phase in all alloys increases to a certain concentration before splitting into an alpha-phase with 6% V and a beta-phase with 33% V, and that the equilibrium solubility of vanadium in beta-titanum is 50% at 400 deg C. The constitution diagram for the Ti-V system with ranges of metastable phase equilibria were drawn. R.J.F.

N85-20074# Joint Publications Research Service, Arlington, Va.
SENSITIVITY OF TITANIUM ALLOYS TO STRESS CONCENTRATION DURING REPEATED STATIC LOADS Abstract Only
S. M. Kutepov, T. S. Pleshakova, and V. I. Rachkov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 34 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 67-69 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The sensitivity of OT4-O and AT3 titanium to stress concentrations during static and repeated static loads is discussed. Studies were made on annealed sheets 6 mm in thickness. In static tear tests, tested titanium alloys were not sensitive to stress concentrations, although the OT4-O samples were more sensitive than those of AT3. Repeated tests also showed the titanium alloys to have little sensitivity to stress concentrations, except under extreme concentration circumstances. R.J.F.

N85-20075# Joint Publications Research Service, Arlington, Va.
IMPROVING OPERATIONAL PROPERTIES OF TITANIUM ALLOYS BY DIFFUSION SILICIDING Abstract Only
L. S. Lyakhovich, I. N. Burnyshev, and L. A. Vasilyev *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 36-37 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Tsvetn. Met. (USSR), no. 1, Jan. - Feb. 1984 p 94-97 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Some properties of silicide coatings obtained by diffusion saturation in powders of silicon with intensifying additives are studied. Diffusion siliciding processes were accelerated by addition of copper powder at the saturation temperature of 850 deg C, 4 hrs., producing silicide layers up to 100 microns thick. Siliciding in silicon powder without the addition of copper under the same temperature conditions achieves. A layer thickness of only 10 to 15 microns. Coatings obtained at 850 deg C, 4 hours in a powder medium containing 87 to 77 mass % Si, 10 to 20 Cu and 3 A/F3 were optimal from the standpoint, of the thickness of the silicide coating and surface quality. R.J.F.

N85-20076# Joint Publications Research Service, Arlington, Va.
KINETICS OF REACTION OF METALS AND NON-METALS DURING DIFFUSION WELDING Abstract Only **c37**
V. A. Bachin *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 39-40 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 2, Feb. 1984 p 25-27 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Topochemical joining and substitution reactions that are fundamental to diffusion welding of metals and non-metals involve both soluble and insoluble products of reaction. Aluminum, magnesium, titanium, zirconium and their alloys are known to react with most glass-like and ceramic materials to form such bonds. This happens through a substitution reaction that takes place with rapidity that differs for each concrete combination as the non-metal reaction products are dissolved into the metal. For example, silicon transforms into silica before bonding to aluminum. At the same time, some loss of tempering occurs, and mathematical calculations must be made to determine acceptable losses of durability for the sake of welded bonds. While substitution reactions must be stopped to prevent loss of temper, joining reactions form insoluble products that retard the reaction and cause it to cease. Author

N85-20077# Joint Publications Research Service, Arlington, Va.
COLLAPSE AND REMOVAL OF DISCONTINUITIES IN JOINT ZONE DURING DIFFUSION WELDING Abstract Only **c37**

V. S. Gostomelskiy *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 40 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 2, Feb. 1984 p 28-30 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Quality joints require elimination of discontinuities, or pores. Changes in the form of an individual pore and a group of pores during diffusion welding were studied in order to determine means of eliminating pores entirely. A mathematical presentation is given for the collapse of a thin disk perpendicular to the direction of compression as it collapses into the pore. Disk volume and dimension and the pressure applied are taken into consideration. Electrical resistance measurements at room temperature by a four-probe method, and metallographic studies were made on templates cut along the load line. Surface fractures in the plane of contact were studied with an electron scanning microscope. At times electrical resistance declined by jumps and pores took on toroidal forms; maintenance of load was subsequently followed by slight recovery of electrical resistance. Results confirmed earlier hypotheses that held that along with diffusion of the toroidal band into the surrounding material, the large radius of the pore grew at the expense of surface diffusion. Author

N85-20078# Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF EFFECTIVENESS OF ELECTRON BEAM WELDING OF TITANIUM ALLOYS UP TO 40 mm IN THICKNESS BY VERTICAL OR HORIZONTAL BEAM Abstract Only c37
Olshanskiy, A. P. Lopatko, and V. R. Petrenko *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 41 Transl. into ENGLISH from Svarochn. Proizv. (Moscow), no. 3, Mar. 1984 p 31-32 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The use of electron beam welding has great promise for titanium alloys, but certain specific defects must be eliminated. Vertical and horizontal electron beam welding was performed on samples 5, 10, 15, 10, 30 and 40 mm in thickness at rates of 5, 10 and 20 meters/hour, with fixed focal length and height above the welded samples. Thin metals were welded effectively with either beam, but with thicker samples, energy consumption decreased 8 to 18% with the horizontal beam. Vertical welding required energy both for the melting operation and to reheat liquid metal that screened the beam. Vertical beams left a dagger-like seam profile, while horizontal electron beam welds had parallel walls. Microstructural changes were also less with horizontal beam welding, and plastic properties of seams were more regular. Author

N85-20079# Joint Publications Research Service, Arlington, Va.
DISTRIBUTION OF HYDROGEN IN MULTI-LAYER WELDED JOINTS OF ALLOYED STEELS Abstract Only
E. L. Makarov and N. I. Yegorov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 41 Transl. into ENGLISH from Svarochn. Proizv. (Moscow), no. 3, Mar. 1984 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The most common defects in welded joints of high-durability alloyed steels are cold cracks, including ones appearing as a result of emission of diffusion hydrogen. A study to define the physical constants of the effective coefficient of hydrogen diffusion, initial diffused hydrogen content and transition of metallurgical hydrogen into the diffused form during heating was undertaken. Heating was conducted in a staged manner from 100 C to melting point. Results showed the first transition of hydrogen at 200 C, with the most intensive transition during heating to 300 to 400 C. Hydrogen distribution was assessed using a non-isothermal two-dimensional procedure, which was used to develop an algorithm and a computer program starting with the seam crystallization stage. The mathematical model was tested experimentally with 14Ch2N3MA steel 40 mm thick, welded with various welding rods. Maximum concentrations of hydrogen and the time required for its accumulation were the basic parameters used to determine the likelihood of cold crack formation, with the time of increased hydrogen saturation another important factor. The calculations can be used to select materials and welding procedures that avoid accumulation of diffused hydrogen. Author

N85-20080# Joint Publications Research Service, Arlington, Va.
WELDABILITY OF ALLOY ABM1 TO ALLOY 1201 Abstract Only c37
A. N. Fokanov, Ye. A. Kuznetsova, V. D. Popov, and R. S. Kurochko *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 42 Transl. into ENGLISH from Svarochn. Proizv. (Moscow), no. 3, Mar. 1984 p 17-19 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Design uses of ABM1 high-modular formed alloy components often require welding, but no studies have been made of procedures or results. The effect of differing thermophysical characteristics during welding, heat adsorption and melt-resistant phases based on beryllium, the tendency of the other metal in many joints (alloy 1201) to lose temper when heated, and variations in hydrogen content in the two alloys were considered. Automatic welding with an argon or argon and helium medium to prevent oxidation resulted in acceptable unoxidized seams, with base metal melting 2 to 2.5 mm from the welding zone. With thin 3 mm samples only a helium medium permitted satisfactory joints. Argon arc welding resulted in a much worse seam. Although the difference in the alloys complicated the test, X-ray pictures of the joints showed apparent flaws as the alloys mixed in the zones containing beryllium. Cracks appeared only at the beginning of seams. Impact strength, which was greater than that of alloy 1201, decreased by a factor of 2 in the melted area, but remained above that of alloy ABM1. Author

N85-20081# Joint Publications Research Service, Arlington, Va.
ULTRASONIC LARGE-DIAMETER PIPE WELD TESTING INSTALLATIONS Abstract Only c37
I. Ya. Shevchenko, V. F. Baldakov, and V. A. Filippenkov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 42 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 3, Mar. 1984 p 40-42 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Two ultrasonic installations for testing of welded joint quality in large diameter pipes were introduced. The U-664 installation consists of two acoustical units placed symmetrically relative to the pipe being tested, and is capable of simultaneously testing both seams on 1200 to 1420 mm diameter pipe at a rate of 20 m/min. The NK-105 unit is designed for testing of joints in 530 to 1220 mm diameter pipe in sections 6 m in length. The device is a U-shaped structure with the acoustical head moving along a track while the pipe itself and the installation remain stationary. The use of the new devices can significantly improve the quality of gas and oil pipes. Author

N85-20082# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF TRANSIENT ZONE IN DIFFUSION WELDING OF TsTS-19 PIEZOCERAMIC WITH AMg6 ALLOY Abstract Only c37
V. G. Novikov, A. I. Yekimov, V. Ye. Kravchenko, N. F. Kazakov, and V. A. Bachin *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 43 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 3, Mar. 1984 p 62-64 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

A study was made of the structure of the transition zone of a joint between TsTS-19 piezoceramic and AMg6 alloy. Disk specimens 35 mm in diameter and 3 to 5 mm thick were welded on an SDVU-50 welding machine under a pressure of 7.5 MPa, temperature 793 K, residual gas pressure 1.33 Pa. Joint structure was studied under an optical microscope, by X-ray diffractometer and a microscopic analyzer. Diffusion welding was found to include solid phase reactions of reduction of lead oxide and diffusion of the components of the alloy, particularly the magnesium, into the ceramic. The transistion zone is a two-phase system consisting of

solid magnesium in the Pb(ZrTi)O3 ceramic and elementary lead. Author

N85-20083# Joint Publications Research Service, Arlington, Va.
ALLOY SUPERCOOLING ON SALYUT-7 Abstract Only c12
I. Melenevskiy *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 53 Transl. into ENGLISH from Trud (Moscow), 11 Apr. 1984 p 4 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

A materials science experiment conducted by the Soviet-Indian crew of the orbiting station Salyut-7 is discussed. The experiment was intended to demonstrate that the supercooling process can be accomplished more easily and less expensively in zero gravity. The experiment represents an initial step toward the industrial production of superdurable materials capable of withstanding radiation and chemical stresses. Indian specialists are credited with preparing the alloy specimens for the experiment. An original method of heating was proposed by scientists of the laboratory of experimental metallurgy in the city of Hyderabad. Author

N85-20084# Joint Publications Research Service, Arlington, Va.
ELECTRON-DIFFRACTION STRUCTURAL EXAMINATION OF AMORPHOUS IRON-TIN ALLOYS Abstract Only
L. A. Zhukova and S. I. Popel *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 56-57 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Met. (Moscow), no. 2, Mar. - Apr. 1984 p 173-179 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The structure of amorphous iron-tin alloys was studied by the electron-diffraction method, amorphous alloys having been found to excel their crystalline counterparts in some performance characteristics. Film specimens containing 31 to 50 atom.% Sn were produced by the vapor deposition process on colloidal substrates. The pattern of diffraction peaks reveals a polyphase structure, no one phase having formed alone because of insufficiently fast cooling. Bifurcation of the first corresponds to an iron-rich phase and a tin-rich phase, both amorphous. Both peaks shift toward shorter wavelengths with longer soaking time, while their amplitudes also change: that of the iron-rich phase decreasing and that of the tin-rich phase increasing. The difference functions characterizing the radial atom distribution, calculated by Fourier analysis of the structural-parameter curves, reveal no intermetallic compounds appearing in the process of equilibrium crystallization. The peaks of these difference functions split into two for the Fe-(31 atom.%) Sn alloy and into three for the Fe-(50 atom.%) Sn alloy. Calculations of interatomic distance and coordination number according to the Vegard rule yield data on both beta and beta' tin phase. Author

N85-20085# Joint Publications Research Service, Arlington, Va.
BENDING TWO-LAYER METAL-POLYMER PLATES Abstract Only c27
E. N. Starovoytov and T. A. Starovoytova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 57 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 100-104 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Laminated plates and covers usually consist of materials with strikingly different physiocomechanical properties, with highly durable, stiff bearing layer and softer materials for monolithic balance, force distribution, and protection from external forces. Procedures required in selecting materials to perform prescribed functions are discussed. The theoretical model is based on a thin metallic bearing surface and a soft polymer that is resistant to deformation. Consecutive linear approximations are used to combine methods for physically nonlinear media and irregular thermoviscosity. Universal nonlinear functions and rheonomic characteristics are plotted for polytetrafluorethylene (Fluoroplast-4) and an aluminum alloy, in the form of a rectangular two-layer plate with free support on the edges. Computer processing made it possible to produce a mathematical solution to a problem of linear viscous resilience theory, although hydrostatic stress was not considered. Author

N85-20086# Joint Publications Research Service, Arlington, Va.
EFFECT OF STRESS CONCENTRATION FATIGUE RESISTANCE OF REFRACTORY NICKEL ALLOYS UNDER ASYMMETRICAL MULTICYCLE LOADING, COMMUNICATION 1 Abstract Only
B. N. Sinayskiy *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 58 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 61-67 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Sharp variations in cross-section of manufactured parts results in local stress increases. In turbines such stress concentrations occur in the transition from blade to shaft and in areas of corrosion and erosion damage. Earlier research had shown that under cyclic stress, nickel alloys display sensitivity to stress concentrations. A series of studies of cyclic and static loads in rolled EP109 and cast ZhS6U nickel alloy products is reported. Experimental data served as starting information for evaluating the effects of stress concentration on fatigue in refractory alloys at various cyclic assymetries and configurations of stress limit diagrams in smooth and notched samples. Analysis of the data presented showed that fatigue and wear life of the tested alloys fit well into the logarithmic coordinate system. Fatigue fractures were found to appear in both tested alloys at 800 C in a plane of stretching stress. Alloy type and amplitude coefficient were of importance, and wear life of little significance, in determining resistance to cyclic and static loads. Fatigue resistance in ZhS6U samples with circular notching was 5 to 40% higher than for EP109, while in smooth samples, fatigue resistance in the ZhS6U was 30 to 80% less than for EP109. Auth

N85-20087# Joint Publications Research Service, Arlington, Va.
MECHANISM OF TITANIUM IMPACT ON BRITTLE TENDENCY IN DELAYED DEFORMATION OF MARTENSITE-AGING STEELS Abstract Only
V. M. Kardonskiy and N. B. Gorbunova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 58 Transl. into ENGLISH from Met. i Term. Obrabotka Met. (Moscow), no. 3, Mar. 1984 p 53-55 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Previous studies have shown that hydrogen can combine with titanium in a solid solution and remain there despite dehydrogenization processes where in titanium atoms are transformed from solid solution to the intermetallide form during aging. Tests have shown that adding aluminum can compensate for loss of titanium during the aging process, when at temperatures of 400 to 450 C, particles with the form Ni3Ti are emitted. This process of hydrogen brittleness and its relation to the second phase during aging are described in detail. Author

N85-20088# Joint Publications Research Service, Arlington, Va.
EFFECT OF FORM MEMORY IN ALLOYS BASED ON Cu-Al SYSTEMS Abstract Only
P. V. Titov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 59 Transl. into ENGLISH from Met. i Term. Obrabotka Met. (Moscow), no. 3, Mar. 1984 p 47-50 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Numerous alloys with form memory are used for various technical purposes, but few have been studied thoroughly. Aluminum-bronze properties such as brittleness and, with ca.14% aluminum, low thermal durability were studied. Addition of nickel, manganese, cobalt or iron results in heat-sensitive alloys with numerous uses. Alloying of Cu-Al containing 13 to 14% Al with 1 to 2%Co, Ni or Mn reduces hysteresis by a factor of 2, while 4 to 5% nickel content reduces it by nearly 4 times, to 10 to 12 C. The nature of form memory relative to cooling and heating is discussed. Reversible plastic deformation is connected to twinning and reorientation of unfavorably oriented martensite crystals. Reversible form changes in Cu-Al alloys can be encouraged by thermal processing. Reduced ability to recall form is attributed to

irregular particles in the beta(1)-phase. Titanium nickelide alloys with good corrosion resistance and electrical resistance are compared to aluminum bronze in terms of form memory and its longevity. Author

N85-20089# Joint Publications Research Service, Arlington, Va.
ELECTRON-PLASTIC EFFECT IN METALS Abstract Only
O. A. Troitskiy *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 59 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 2, Feb. 1984 p 103-106 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Research in electron-plastic effects in metals is surveyed. Kravchenko made a theoretical study of dislocations caused by electrical current and its retardation by conductive electrons. The electron-plastic effect (EPE) presumes the presence of electron dislocational and drifting electrons reacting with dislocation stoppers. A different viewpoint gives emphasis to the effect of temperature gradients on plastic deformation of metal, despite a lack of experimental evidence. Some authors failed to show their methods for controlling temperature even when attempting to demonstrate the importance of temperature on metal shaping. Others have neglected to describe all instrumentation and side effects in their study of the mechanism of high-intensity current on plastic deformation. Still others relate the Ampere law to distortions, even though the resulting sudden shifts have nothing to do with EPE. The failure of another study to find EPE in lead is attributed to the fact that at the given temperature of 4.2 deg K, lead is in superconductor state. In summary, the failure of various authors to consider the electron-plastic effect as an independent physical phenomenon is stressed. Author

N85-20090# Joint Publications Research Service, Arlington, Va.
EFFECT OF TEMPERATURE AND DEFORMATION RATE ON HARDNESS OF COPPER Abstract Only
V. P. Krashchenko and O. B. Oksametnaya *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 60 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 2, Feb. 1984 p 52-55 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

Despite its effects, many authors do not present data on the time of deformation in reporting research on hardness. The rate of indentor operation at various temperatures and its effect on hardness are discussed. Thermodynamic activation analysis of shaping of pure copper at 0.25 to 0.9 of the melting temperature was made after annealing at 823 K in a vacuum chamber at less than 0.7 MPa for 1 hour. Rate of deformation was defined as a ratio of the degree of plastic deformation to the time of indentor penetration into the sample. Results showed that the hardness of the copper decreased in inverse correlation to the rise in temperature, while increasing the rate of deformation increased the level of hardness without changing its character. The temperature at which dislocational slippage changed into dislocational creep shifted into a higher temperature range as the rate of deformation increased. Changes in hardness and durability were subject to the exponential law, and in the dislocation creep (high temperature) range, self-diffusion takes place along dislocations caused by deformation. Author

N85-20091# Joint Publications Research Service, Arlington, Va.
EFFECT OF MACROSTRUCTURE ON DURABILITY OF POLYCRYSTALLINE GRAPHITE Abstract Only **c24**
A. S. Kotosonov, I. Ya. Levintovich, V. I. Volga, and N. F. Kaluzhskikh *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 60 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 2, Feb. 1984 p 50-52 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

The production of construction graphite with predetermined durability requires knowledge of the interrelation between durability and structural defects. Micro- and macrostructural faults and porosity have been considered in previous studies. Strength limits during flexing are compared with characteristics of macrostructure by a study of VPP hardened coke prepared in a variety of ways. Electronic properties and ductility were assessed to determine structural features. Results indicated that microstructural features, as shown in magnetic resistance and paramagnetic receptivity, were not tied to durability. The development of macrofissures and damage by destructive loading were macrostructural factors that contributed to failure, and the coefficient of ductility was found to be a useful parameter for predicting durability of graphite products. Author

N85-20092# Ames Lab., Iowa.
INVESTIGATION OF VANADIUM SOLID SOLUTION AND ZETA PHASE REGIONS OF VANADIUM-CARBON SYSTEM
A. H. Ghaneya and O. N. Carlson 1984 20 p refs Presented at the Am. Inst. of Mining, Metallurgical and Petroleum Engineers Conf., Detroit, 17-21 Sep. 1984
(Contract W-7405-eng-82)
(DE85-002678; IS-M-519; CONF-8409179-2) Avail: NTIS HC A02/MF A01

The vanadium-rich solvus of the V-C system was determined for the temperature range of 1100 to 1650 C. The solubility decreases from a maximum of 4.3 at. % C at 1650 to 0.5 at. % C at 1100 C. The heat of solution for carbon in vanadium was determined to be 83.7 kJ/mol. No evidence was found for the postulated ordered phase V64C from TEM, microscopic or electron diffraction studies. The existence of a zeta phase having the stoichiometry V(4)C (3-x) where x = 0.33 was confirmed by X-ray and metallographic evidence. Its peritectoid decomposition temperature was determined by differential thermal analysis to be 1320 +/- 10 C. The hardness of quenched V-C alloys increases monotonically with carbon content over the range of 0.02 to 0.64 at. % C. Quenched alloys aged at 300 C for different times show a maximum in the hardness at about one hour. DOE

N85-20093# Argonne National Lab., Ill. Materials Science and Technology Div.
INFLUENCE OF WORK-HARDENING ON THE PORTEVIN-LECHATELIER EFFECT
Ricardo B. Schwarz Oct. 1984 3 p ref Presented at the 4th Simposio Chileno de Fisica, Santiago, Chile, 26-28 Dec. 1984
(Contract W-31-109-eng-38)
(DE85-002505; CONF-841247-1-Abst) Avail: NTIS HC A02/MF A01

Serrated flow is predicted in a defined deformation-note/strain regime. The prediction is in excellent agreement with recent tests on Al-6061 alloys. DOE

N85-20094# Argonne National Lab., Ill. Materials Science and Technology Div.
AMORPHOUS NI-TI ALLOYS: A NEW METHOD OF SYNTHESIS
Ricardo B. Schwartz 1984 3 p refs Presented at the 4th Simposio Chileno de Fisica, Santiago, 26-28 Dec. 1984
(Contract W-31-109-eng-38)
(DE85-002744; CONF-841247-2-Abst) Avail: NTIS HC A02/MF A01

In order to determine the cause of the amorphization by mechanical alloying, Ni(sub x)Ti(sub 1-x) ($0.1 < x < 0.8$) were prepared by mechanical alloying and studied using XRD and SEM. Results indicate that amorphization by mechanical alloying proceeds through isothermal solid-state reactions. DOE

N85-20095# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
STRUCTURAL STUDIES OF SPUTTERED Ni-As-O FILMS
S. S. Laderman, A. Bienenstock, R. Flasck (Energy Conversion Devices, Inc., Troy, Mich.), and F. Betts (Hospital for Special Surgery, New York) 1984 34 p refs
(Contract DE-AC03-82ER-13000)
(DE85-003229; DOE/ER-13000/T3) Avail: NTIS HC A03/MF A01

The combined results of chemical analysis, X-ray diffraction and extended X-ray absorption fine structure (EXAFS) studies

demonstrate that the majority of Ni atoms in sputtered Ni-As-O films are best described as covalently bonded to six As atoms in a noncrystalline phase. The arrangement of nearest neighbors about the Ni atoms is very similar to that found in crystalline NiAs2. DOE

N85-20096# Sandia Labs., Albuquerque, N. Mex.
ANALYTICAL ELECTRON MICROSCOPY: A POTENTIAL NEW TOOL IN THE STUDY OF MATERIALS COMPATIBILITY
A. D. Romig, Jr. Oct. 1984 39 p refs
(Contract DE-AC04-76DP-00789)
(DE85-003271; SAND-84-1422) Avail: NTIS HC A03/MF A01

The analytical electron microscope (AEM) is proving to be a powerful tool for the study and characterization of engineering materials is including metals, ceramics and polymers. High resolution characterization is possible via several techniques including high resolution imaging in which features less than 1 nm can be resolved, high resolution compositional analysis by X-ray energy dispersive spectrometry and electron energy loss spectrometry in which chemical compositions can be determined from volumes less than 50 nm in diameter, and high resolution convergent beam microdiffraction in which the crystallographic nature of small volumes, less than 50 nm in diameter, of the material can be determined. With these techniques it is possible to characterize reactions within materials and between materials at a spatial scale unattainable by other analytical techniques. The basic principles of AEM are described and several examples of applications to materials discussed. Specific examples include characterization of uranium alloys, analysis of hot-cracking failures in austenitic stainless steel weldment heat affected zones, and diffusion in refractory metal alloys. DOE

N85-20097# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
ASSESSMENT OF THE NEED FOR AN ADVANCED HIGH-STRENGTH CHROMIUM-MOLYBDENUM STEEL FOR CONSTRUCTION OF THIRD-GENERATION GASIFIER PRESSURE VESSELS
R. W. Swindeman, R. D. Thomas, R. K. Nanstad, and C. J. Long Oct. 1984 56 p refs
(Contract DE-AC05-84OR-21400)
(DE85-002865; ORNL/TM-8873) Avail: NTIS HC A04/MF A01

The process conditions, construction methods, and materials selections for near-term gasifier pressure vessels were examined to determine whether or not an immediate need exists for an advanced high-strength chromium-molybdenum steel. Second-generation gasifier vessels will be a B relatively small, 3 to 6m (10 to 20 ft) in diameter, will operate at low pressures, 5.2 MPa (750 psi) or less, and will be cooled by waterwalls or water jackets to keep the temperature low, 316 C (600 F) or less. For most gasifiers, carbon steel appears to be an adequate material for construction; however, some gasification processes being examined could require operating presures to 8.3 MPa (1200 psi). The eventual commercialization of these processes would require vessels with diameters of 9m (30 ft) or more. DOE

N85-20098# Pacific Northwest Lab., Richland, Wash.
HEAVY ION INDUCED CRYSTALLIZATION IN AMORPHOUS PHASES
John L. Brimhall Jul. 1984 15 p refs Presented at the Ion Beam Modification of Materials Conf., Ithaca, N.Y., 16-20 Jul. 1984
(DE85-003114; PNL-SA-12097; CONF-840760-16) Avail: NTIS HC A02/MF A01

Bombardment of an amorphous phase with high energy, heavy ions both lowered the crystallization temperature and changed the crystallization mode compared to annealing without concurrent ion bombardment. Ion bombardment caused a direct transformation to the equilibrium crystalline phase or phases from the amorphous phase with no intermediate phase formation. These radiation effects were observed in three sputter-deposited, amorphous alloys: Fe61Cr17 Ni8W14, Ni50Mo50 and Ni45Ti55. The lowering of the crystallization temperature is attributed to an increase in the excess free volume in the amorphous structure by the irradiation which consequently increases atomic mobility. This is analogous to radiation-enhanced diffusion phenomenon in crystalline structures. The high degree of localized atom displacements in cascades induced by the heavy ions should also provide sufficient activation to form the equilibrium phases without the necessity of forming metastable phases. No metastable phases were observed during annealing of amorphous Ni45Ti55; therefore, ion bombardment had little effect on the crystallization mode in this particular alloy. DOE

N85-20099# Pacific Northwest Lab., Richland, Wash.
CONTRIBUTIONS OF SEGREGATED PHOSPHORUS TO THE INTERGRANULAR STRESS CORROSION CRACKING OF NICKEL
R. H. Jones, M. J. Danielson, S. M. Bruemmer, D. R. Baer, and M. T. Thomas Feb. 1984 20 p refs Presented at TMS-AIME Fall Meeting, Philadelphia, Pa., 2 Oct. 1983
(Contract DE-AC06-76RL-01830)
(DE85-003112; PNL-SA-11270; CONF-8310205-12) Avail: NTIS HC A02/MF A01

Phosphorus segregated to the grain boundaries of nickel was observed transpassive potentials in 1 N H2SO4 while sulfur had a negligible effect. Crack tip chemistry estimates for a phosphorus enriched intergranular crack were made using a model by Turnbull. It is indicated that a potential drop of 40 mV would occur in a 2 mm long, 10 micron wide crack and that the solution at the crack tip would be saturated with nickel ions. Crack tip corrosion rate estimates were used in conjunction with a stress corrosion model by Parkins to indicate that the IGSCC rate was 10 to 180X faster than the calculated value. The discrepancy between the measured and calculated crack growth rates may reflect limitations in the crack tip corrosion rate or crack growth rate modeling or a mechanical contribution to the crack growth rate. Differences between intergranular corrosion and stress corrosion tests show that the application of a stress caused intergranular cracks to be aligned perpendicular to the stress direction while intergranular corrosion crevices were randomly oriented. Intergranular stress corrosion cracks occurred at potentials of +0.4 to 1.5 V (SCE) while intergranular corrosion only occurred at potential greater than +1.4 V (SCE). DOE

N85-20100# Hanford Engineering Development Lab., Richland, Wash.
CONDUCTIVITY CHANGES IN NEUTRON-IRRADIATED COMMERCIAL COPPER ALLOYS AT APPROXIMATELY 450(O)C
H. R. Brager and F. A. Garner 1984 3 p ref
(Contract DE-AC06-76FF-02170)
(DE85-003007; HEDL-7503) Avail: NTIS HC A02/MF A01

The electrical conductivity changes induced in nine copper-base alloys during irradiation at 450 C ion FFTF were measured. Alloys which contain beryllium as one of their constitutents exhibit an increase in electrical conductivity, while those that do not contain beryllium exhibit a decrease in conductivity. The change in conductivity appears to correlate with the original conductivity of the alloy. DOE

N85-20101# California Univ., Berkeley. Lawrence Berkeley Lab.
EFFECT OF RHODAMINE-B ON THE ELECTRODEPOSITION OF LEAD ON COPPER, REVISION
J. C. Farmer and R. H. Muller Sep. 1984 43 p refs Presented at the 163rd Electrochem. Soc. Meeting, San Francisco, 8 May 1984
(Contract DE-AC03-76SF-00098)
(DE85-000674; LBL-17014-Rev; CONF-830508-28-Rev) Avail: NTIS HC A03/MF A01

Rhodamine-B chloride (10(micro)M) was used as a model plating additive in a study of the electrodeposition of Pb from 1 M NaClO4, 0.5 and 5 mM Pb (++) (pH 3) on Cu. Ellipsometer measurements during cyclic voltammetry have shown that the addition of dye results in a more compact bulk deposit than obtained in its absence. It also prevents complete monolayer coverage during formation of the Pb underpotential deposit and shifts the bulk deposition peak to more cathodic potentials during the first potential

cycle. Dye effects on potential and micromorphology disappear during subsequent cycling, but reappear after relaxation periods at open circuit. Depletion and readsorption of dye on the surface have been confirmed by spectroscopic ellipsometry. Different optical film models were investigated for the interpretation of spectroscopic ellipsometer measurements by use of multidimensional analysis. DOE

N85-20102# Pacific Northwest Lab., Richland, Wash.
NON-ISOTHERMAL IRRADIATION CREEP OF NICKEL ALLOYS INCONEL 706 AND PE-16
E. R. Gilbert and B. A. Chin Jun. 1984 18 p refs Presented at the 12th Intern. Symp. on Effects of Radiation on Mater., Williamsburg, Va., 18 Jun. 1984
(Contract DE-AC07-76RL-01830)
(DE85-000842; PNL-SA-11780; CONF-840604-27) Avail: NTIS HC A02/MF A01

The results of in-reactor step temperature change experiments conducted on two nickel alloys, PE-16 and Inconel 706, were evaluated to determine the creep behavior under nonisothermal conditions. The effect of the temperature changes was found to be significantly different for the two alloys. Following a step temperature change, the creep rate of PE-16 adjusted to the rate found in isothermal tests at the new temperature. In contrast for Inconel 706, a reduction in temperature from 540 to 425 C produced a 300% increase in creep above that measured at 540 C in isothermal tests. The response of in-reactor creep in Inconel 706 to temperature changes was attributed to the dissolution of the gamma double-prime phase and subsequent loss of precipitation-strengthening at temperatures below 500 C. DOE

N85-20103# Pacific Northwest Lab., Richland, Wash.
FABRICATION AND PROPERTIES OF TUNGSTEN HEAVY METAL ALLOYS CONTAINING 30% - 90% TUNGSTEN
W. E. Gurwell, R. G. Nelson, G. B. Dudder, and N. C. Davis Sep. 1984 79 p refs
(Contract DE-AC06-76RL-01830)
(DE85-000152; PNL-5218) Avail: NTIS HC A05/MF A01

In 1983, Pacific Northwest Laboratory conducted a survey of tungsten heavy metal alloys having lower-than-normal (<90%) tungsten content. The purpose of the work was to develop tougher, more impact-resistant high-density alloys for applications benefitting from improved mechanical properties. Tungsten heavy metal alloys of 30 to 90% tungsten content were fabricated and their mechanical properties measured. Although ultimate strength was essentially independnet of tungsten content, lower tungsten-content alloys had lower yield stress, hardness, density, and decidedly higher elongations and impact energies. Cold work was effective in raising strength and hardness but deterimental to elongation and impact energies. Precipitation hardening and strain aging raised hardness effectively but had less influence on other mechanical properties. DOE

N85-20104# Monsanto Research Corp., Miamisburg, Ohio.
PROPERTIES AND THERMAL STABILITIES OF AMORPHOUS TRANSITION METAL HYDRIDES
R. C. Bowman, Jr., J. S. Cantrell, E. L. Venturini, R. Schulz, J. E. Wagner, A. Attalla, and B. D. Craft 1984 5 p refs Presented at 5th Intern. Conf. on Rapidly-Quenced Metals, Wurzburg, West Germany, 3 Sep. 1984 Prepared in cooperation with Miami Univ., Oxford, Ohio, Sandia Labs., Albuquerque, N. Mex., California Inst. of Tech., Pasadena
(Contracts DE-AC04-76DP-00789; DE-AC04-76DP-00053)
(DE85-002117; MLM-3156(OP); CONF-8409107-7) Avail: NTIS HC A02/MF A01

The properties of amorphous ternary hydrides produced from ZR-based metallic glasses were studied. The effects of hydrogen concentration on the electronic structure properties, proton, diffusion, behavior and thermal stabilities of the amorphous a-Zr2PdH (sub x) and a-Zr3RhH (sub x) systems are discussed. Amorphous a-Zr2PdH (sub x) and a-Zr3RhH (sub x) exhibit enhanced proton diffusion relative to that observed in related crystaline hydrides. The magnetic susceptibilities and superconducting T(sub c) values for these glasses indicate systematic decreases in the densities of Fermi level electronic states with increasing hydrogen content. When the glassy alloys are heated above 700K, they undergo exothermic transitions to form crystalline intermetallics. However, the glassy hydrides irreversibly decompose to produce crystalline ZrH(sub x) under similar conditions. Several differences are noted between the thermal stabilities of a-Zr2PdH (sub x) and a-Zr3RHH(sub x). DOE

N85-20105# Brookhaven National Lab., Upton, N. Y. Physics Dept.
THE PHYSICAL MODELLING OF TRANSITION METAL ALLOYING: THE ROLES THAT DIFFERENT LEVELS OF THEORY PLAY
R. E. Watson and L. H. Bennett 1984 15 p refs Presented at the High-Temp. Alloys: Theory and Design Conf., Bethesda, Md., 8 Apr. 1984 Prepared in cooperation with NBS, Washington, D.C.
(Contract DE-AC02-76-CH-00016)
(DE85-000591; BNL-35276; CONF-840417-8) Avail: NTIS HC A02/MF A01

This paper is concerned with the properties of the ordered transition metal alloys, in particular, the prediction of the enthalpy of one system versus another. The current status of the results of the most detailed electron energy band machinery is reviewed as are cruder (and more economical) schemes. Evidence is presented indicating that electronic contributions are important to the relative entropy of one structure versus that of another and it is suggested that electronic (and phonon) contributions to a relative entropy should be a more severe test of detailed band theory than is the calculation of the relative enthalpy. The volume effects attending transition metal alloy formation are also considered. DOE

N85-20106# National Bureau of Standards, Washington, D.C. Metallurgy Div.
PATTERNS IN THE OCCURRENCE OF THE BRITTLE TOPOLOGICALLY CLOSE-PACKED PHASES: Al
L. H. Bennett and R. E. Watson 1984 12 p refs Presented at the High-Temp. Alloys: Theory and Design, Bethesda, Md., 8 Apr. 1984; sponsored by AIME Prepared in cooperation with Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-000592; BNL-35275; CONF-840417-9) Avail: NTIS HC A02/MF A01

Precipitation of sigma and structurally related phases can weaken or embrittle superalloys and stainless steels. These phases, known generically as topologically close-packed (TCP) structure occur in many transition-metal alloys. Methods of predicting their appearances include examination of phase diagrams and the use of d-band electron-vacancy concentrations for the transition elements. The use of an effective set of such d-vacancy values for the transition elements is reviewed. An effective d-electron vacancy value between that of Rh and Ru is assigned to the important nontransition element Al. DOE

N85-20107# Sandia Labs., Albuquerque, N. Mex.
EFFECTS OF HYDROGEN ON MAGNETIC PROPERTIES OF AMORPHOUS ZIRCONIUM ALLOYS
E. L. Venturini, R. C. Bowman, Jr., and J. S. Cantrell 1984 13 p refs Presented at 30th Ann. Conf. on Magnetism and Magnetic Mater., San Deigo, Calif., 27 Nov. 1984 Prepared in cooperation with Monsanto Research Corp., Miamisburg, Ohio, Miami Univ., Oxford, Ohio
(Contract DE-AC04-76DP-00053)
(DE85-003303; MLM-3219(OP); CONF-841184-16) Avail: NTIS HC A03/MF A01

The magnetic susceptibilities chi(T) of the amorphous ternary hydrides of the paramagnetic metallic glasses a-Zr2Pd and a-Zr3Rh were measured between 7K and 300K. It was found that chi(T) of both a-Zr2Pd (H sub x) and a-Zr3Rh (H sub x) decreases substantially with increasing hydrogen content. This behavior is primarily attributed to reductions in the densities of the Fermi level electronic states. Although chi(T) for crystalline Zr2Pd

(MoSi2 structure type) is smaller than the susceptibility of the a-Zr2Pd glass, chi(T) for a crystallized Zr3Rh sample was found to increase relative to the initial susceptibility for this glass. DOE

N85-20108# Oak Ridge National Lab., Tenn.
INITIAL DEVELOPMENT OF NICKEL AND NICKEL-IRON ALUMINIDES FOR STRUCTURAL USES
C. T. Liu, W. Jemian, H. Inouye, J. V. Cathcart, S. A. David, J. A. Horton, and M. L. Santella Aug. 1984 62 p refs
(Contract DE-AC05-84CR-21400)
(DE84-016641; ORNL-6067) Avail: NTIS HC A04/MF A01

Initial development of ductile nickel and nickel-iron aluminides has concentrated on boron-doped Ni3Al alloyed with iron and other elements. The aluminide can dissolve no more than 15 at % Fe, beyond which formation of both transformed B2 phase ((BETA)') and disordered fcc phase ((GAMMA)) is observed. Nickel-iron aluminides were tensile tested as a function of temperature. Iron additions strengthen Ni3Al effectively at temperatures to 850 C. The yield stress of the nickel-iron aluminides increases with test temperature and reaches a maximum around 650 C. The high-temperature strength of the aluminides can be further improved by alloying with less than 2 at. % Hf. Hafnium-modified aluminides are stronger than commercial superalloys, including some cast superalloys. Hot corrosion behavior of nickel-iron aluminides was determined in quartz capsules and in a circulating loop system containing a supply of CaSO4 at temperatures to 871 C (1600 F). The combined results from these tests showed the dependence of sulfidation on oxygen partial pressure and verified that the sulfidation attack of aluminides in capsule tests was caused by oxygen depletion. DOE

N85-20109# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.
EFFECT OF MICROSTRUCTURE ON SOLID PARTICLE EROSION IN MULTIPHASE MATERIALS Final Report, May 1983 - Feb. 1984
H. Conrad and R. O. Scattergood 1984 48 p refs
(Contract DE-AS05-83ER-45004)
(DE85-000426; DOE/ER-45004/1) Avail: NTIS HC A03/MF A01

The program progress has accomplished the following: (1) relocation and setting up of a new laboratory for erosion research, which is to be used for the remainder of the program; (2) design, construction, and upgrading of equipment for the air blast type erosion apparatus; (3) extensive velocity calibrations for the erosion apparatus, including the design and implementation of a new calibration method; (4) acquisition of the initial series of alloys for the Al-Si and WC-Co work and a unique alumina-stainless steel composite; (5) initiation of the metallographic work and erosion rate (weight-loss) measurements; and (6) initiation of a joint program with Argonne National Laboratory. DOE

N85-20110# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Section.
1984 MODEL OF BINARY ALLOY SOLIDIFICATION
D. G. Wilson, V. Alexiades, and A. D. Solomon 1984 13 p refs
(Contract DE-AC05-84OR-21400)
(DE85-002497; DOE/OR-21400/T61) Avail: NTIS HC A02/MF A01

A macroscopic mathematical model describing the idealized solidification of a mixture or binary alloy is presented. The formulation is global as a pair of conservation laws for mass and energy valid over the entire region. This generalizes the idea of coupling the separate equations for the diffusion of temperature and material. The problem is formulated in a weak or distributional sense. It is not required to explicitly track the interracial region which may develop into a mushy region. Both problem formulation and numerical results are discussed. DOE

N85-20111# California Univ., Livermore. Lawrence Livermore Lab.
EFFECT ON WORK-HARDENING IN DYNAMIC DEFORMATION OF BERYLLIUM
D. J. Steinberg Sep. 1984 32 p refs
(Contract W-7405-eng-48)
(DE85-002691; UCID-20243) Avail: NTIS HC A03/MF A01

Results from Hopkinson Split-bar, plate-impact, and cylinder deceleration experiments on beryllium are compared with hydrodynamic computer code simulations. Bys substantially increasing the beryllium work-hardening in the Steinberg-Guinan constitutive model, excellent agreement between the experiments and the calculations is achieved. In addition, the plate-impact experiments show that the Hugoniot is in excellent agreement with previous results, and that there is not evidence of any phase change up to 35 GPa. DOE

N85-20112# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF MILL RUN AND TEMPER VARIATIONS ON BARRIER ANODIC FILM FORMAT ION ON 6061 ALUMINUM ALLOY
J. K. G. Panitz, D. J. Sharp, and F. E. Martinez Oct. 1984 36 p refs
(DE85-000447; SAND-83-1659) Avail: NTIS HC A03/MF A01

The relationship between barrier anodic film formation and variations in the composition and microstructure of 6061-T6 aluminum alloy samples from three different mill runs was investigated along with characteristics of coatings formed on 6061 alloy samples with more extreme microstructure differences produced by two of heat treatment. The differences between the coatings formed on samples from the three different mill runs are small. Large differences occur in the processing characteristics and dielectric properties of coatings formed on heat treated 6061 samples compared to the 6061-T6, as received stock. Samples which were heated to 500 C and cooled slowly take substantially longer to process compared to 6061-T6 as received stock, and 500 C, rapid quenched samples. The coatings on 500 C, slow cooled samples display substantially inferior dielectric properties. The anodization characteristics of annealed vs work hardened, pure aluminum samples studied indicate that the different coating characteristics displayed by the treated alloy samples are related to differences in the size and/or distribution of precipitates associated with the alloying components. DOE

N85-20113# Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
HYDROGEN ATTACK OF STEEL Final Report
Paul G. Shewmon Mar. 1984 23 p refs
(Contract DE-AC02-82ER-12077)
(DE85-002645; DOE/ER-12077/T2) Avail: NTIS HC A02/MF A01

Hydrogen attack in commercial quenched and tempered 2 1/4 Cr - 1 Mo steel was studied. The sensitive dilatometer developed in the past was used. The Nelson curve for 2 1/4 Cr - 1 Mo steel was updated. Both the curve and rationale for the curve are included. DOE

N85-20114# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Physics.
PHOTON SCATTERING AND INTERACTION ANALYSIS OF INTERFACIAL CORROSION AND CATALYSIS Technical Progress Report, Sep. 1983 - 30 Sep. 1984
T. E. Furtak 1984 10 p
(Contract DE-AC02-82ER-12032)
(DE85-002534; DOE/ER-12032/03) Avail: NTIS HC A02/MF A01

Significant progress was made toward the understanding of the surface enhanced Raman effect. This phenomenon is related to active complexes whose electronic characteristics are defined by co-absorbed species from the solution. The confusing effects of active complexes were minimized and vibrational phenomena were studied on electromagnetically active surfaces which do not have a significant population of active complexes. Progress was made toward an integrated optical approach to thin film studies through experimental and theoretical success with the photovoltage technique. Induced defects in an oxide film were shown to be related to spectral features in the photovoltage and to modifications of the transient behavior of the signal. Work is described on a

scanning ellipsometer, the in situ infrared tests, and in plans for in situ surface EXAFS. Preliminary results of second harmonic generation on oxidized metals are described. R.S.F.

N85-20115# Brookhaven National Lab., Upton, N. Y.
ROLE OF NITROGEN IN IMPROVING RESISTANCE TO LOCALIZED CORROSION IN AUSTENITIC STAINLESS STEELS
R. Bandy, Y. C. Lu, R. C. Newman, and C. R. Clayton 1984 12 p refs Presented at Fall Meeting of the Electrochem. Soc., New Orleans, La., 7 Oct. 1984 Prepared in cooperation with State Univ. of New York, Stoney Brook
(Contract DE-AC02-76CH-00016)
Avail: NTIS HC A20/MF A01

Nitrogen additions of 0.45 to 0.5 wt % to an sustenitic stainless steel containing about 22 Cr, 20 Ni and 6 Mo (all wt %) dramatically enhance its resistance to localized corrosion. The electrochemical behavior of this alloy was studied as a function of chloride ion concentration and temperature. Also, its corrosion resistance was compared with that of a similar commercial alloy with normal residual nitrogen of only 0.04 wt %. Compositional analyses of the passivated surface of the high nitrogen alloy show an enrichment nitrogen at the metal-passive film interface, with a binding energy similar to that of the bulk nitrogen on the fully sputtered surface. The role of nitrogen in enhancing the corrosion resistance is discussed in light of the above results and some recent concepts on passivity. DOE

N85-20116# Oak Ridge National Lab., Tenn.
WELDABILITY AND MECHANICAL PROPERTY CHARACTERIZATION OF WELD CLAD ALLOY 800 H TUBESHEET FORGING
J. F. King and H. E. McCoy Sep. 1984 24 p refs
(Contract DE-AC05-84OR-21400)
(DE85-001737; ORNL/TM-9108) Avail: NTIS HC A02/MF A01

The weldability of an alloy 800H forging that simulates a stream generator tubesheet is studied. Weldability was of concern because a wide range of microstructures was present in this forging. The top and portions of the bottom were weld clad with ERNi-C-3 weld metal to a thickness of 19 mm similar to that anticipated for HTGR steam generators. Examinations of the clad fusion line in various regions revealed no weldability problems except possibly on the bottom portion, which contained large grains and some as-cast structure. A few microfissures were evident in this region, but no excessive hot cracking tendency was observed. The tensile properties in all areas of the clad forging were reasonable and not influenced greatly by the microstructure. The elevated-temperature tests showed strong tendency for fracture in the heat-affected zone of the alloy 800H. Creep failure at 649 C consistently occurred in the heat-affected zone of the alloy 800H, but the creep strength exceeded the expected values for alloy 800H. DOE

N85-20117# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
MICROGRAPHIC AND FRACTOGRAPHIC EXAMINATION OF ALLOYS 2214 AND 2024 FOR CONDITIONS WHICH WOULD CAUSE BURNING OF THE METAL ON BEING PUT INTO SOLUTION, TRIAL 17/175 [EXAMEN MICROGRAPHIQUE ET FRACTOGRAPHIQUE SUR LES ALLIAGES 2214 ET 2024 POUR DES CONDITIONS DE MISES EN SOLUTION POUVANT ENTRAINER LA BRULURE DU METAL]
Poppe 22 Aug. 1984 64 p In FRENCH Sponsored by STPA
(DGT-23.419) Avail: NTIS HC A04/MF A01

Methods to judge the extent of burning of 2024 et 2214 alloys during heat treatment were studied. Micrographic, microfractographic, and nondestructive methods were tested. Tensile and fatigue characteristics are unchanged up to burn thresholds 510 C for 2214, 500C for 2024. The first signs of burning appear at 510 to 515C for 2214, and 500 to 505C for 2024. A nondestructive method using eddy currents reveals that electrical conductivity diminishes as solution temperature increases, but the values found in the tests cannot be used for quality control, since the blocks used are not representative of alloy sheets due to the number of tests carried out and, especially, their dimensions. Author (ESA)

N85-20118# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.
FATIGUE CRACK GROWTH IN ARAMID REINFORCED ALUMINUM LAMINATES (ARALL): MECHANISMS AND PREDICTIONS
Roelof Marissen Jul. 1984 119 p refs Sponsored by Deutsche Forschungsgemeinschaft
(DFVLR-FB-84-37; ISSN-0171-1342) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 35

A program to predict fatigue crack growth rates in aramid reinforced aluminum laminates (ARALL) was developed. Satisfactory correspondence between tests and predictions is found. The ratio between delamination distance and crack length is established. It changes due to a self-similar growth process during the fatigue life. This self-similar growth process governing the delamination distance to crack length ratio is influenced by all loading and material parameters. The correspondence between tests and predictions indicates that the main fatigue damage mechanisms of ARALL are understood. Author (ESA)

N85-20119# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
CRACK GROWTH GEOMETRY IN ALUMINUM ALLOY SHEET MATERIAL UNDER FLIGHT SIMULATION LOADING. 1: A COMPARISON BETWEEN TWIST AND MINITWIST FALSTAFF AND SHORT FALSTAFF. 2: EFFECT OF TRUNCATING HIGH LOADS
J. Schijve, A. M. Vlutters, Ischan, and J. C. Provokluit Sep. 1984 27 p refs
(VTH-LR-441) Avail: NTIS HC A03/MF A01

Crack propagation tests were carried out on 2024-T3 sheet specimens to study the effects of omitting low amplitude cycles from the the gust dominated TWIST load sequence (miniTWIST) and the removal of small load ranges from the maneuver dominated FALSTAFF load sequence (short FALSTAFF). High amplitude loads of TWIST and miniTWIST were truncated at different levels. Fatigue life under MiniTWIST loading is considerably larger than for TWIST. Low-amplitude cycles can contribute significant fatigue damage. Fatigue life under short FALSTAFF is the same as for FALSTAFF. Truncation of the TWIST and MiniTWIST load spectrum at a higher amplitude level implies a significantly slower crack growth in 2024-T3 material, due to significant crack growth retardation introduced by severe flights. An initially decreasing crack growth rate during increasing crack length is observed if high truncation levels are adopted. Author (ESA)

N85-20120# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
ANALYSIS OF DIFFUSION IN AN ION-IMPLANTED ALLOY USING A PHENOMENOLOGICAL MODEL
A. D. Marwick and J. E. Hobbs Nov. 1984 20 p refs Presented at Ion Beam Modification Mater., Cornell, England, 1984
(AERE-R-11527) Avail: Issuing Activity

Recent measurements of the evolution of 30 keV Mn implants in nickel under 75 keV Ni bombardment at 500 C are analyzed using a phenomological model of radiation-enhanced diffusion and segregation in given point defect concentrations. The calculation of the mean point defect profiles from the time dependent concentrations induced by the impact of individual ions is briefly described, and it is shown that, with the experimental flux of 2.39 x 10 to the 16th power/sq m/s, there is negligible recombination between the defects from different cascades. The calculated defect concentrations are used to test a prediction of the phenomenological model, namely that the Mn profile after high dose irradiation is proportional to the point defect concentration profile raised to a power. This relationship is found to hold between the measured solute profile and the calculated defect concentrations. The value of the power is shown to be consistent with the segregation of the Mn being predominantly a vacancy mechanism. Author

N85-20121# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
APPLICATION OF RAMAN, TEM AND OTHER ION BASED TECHNIQUES TO OXIDATION PROBLEMS
M. J. Bennett Oct. 1984 18 p refs Presented at Inst. of Corrosion Sci. Div. Meeting at UK Corrosion 1984, London, 12-14 Nov. 1984
(AERE-R-11447) Avail: Issuing Activity

Recent developments are described on the potential application to high temperature corrosion studies of four procedures; analytical electron microscopy, laser Raman surface microscopy, elastic recoil detection analysis, and thin layer activation. Author

N85-20122# United Kingdom Atomic Energy Authority, Harwell (England). Materials Development Div.
THE ROLE OF VOID NUCLEATION IN THE SWELLING RESISTANCE OF FERRITIC STEEL
E. A. Little Oct. 1984 18 p refs
(AERE-R-11525) Avail: Issuing Activity

FV448 ferritic-martensitic stainless steel was irradiated with 1 MeV electrons to damage levels up to 40 displacements per atom at temperatures in the range 350 to 500 C. The microstructures after irradiation were evaluated and compared with those produced by fast reactor irradiations to similar dose levels. Electron irradiation induces spatially homogeneous dislocation substructures and a uniform high density of small slow-growing voids, giving low swelling rates at a peak swelling temperature of approximately 425 to 450 C. The microstructural evolution is in marked contrast to the heterogeneous dislocation substructures and near swelling immunity observed after fast reactor irradiation. The results are discussed in terms of void nucleation events, simplified rate theory and a previously proposed model for swelling resistance of ferritic steels based on a duplex system of interstitial dislocation loop geometries. The implications of the observed microstructures on the maintenance of long-term swelling resistance of ferritic steels in both fast and fusion reactor environments are briefly considered. Author

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-20123* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THERMOSET-THERMOPLASTIC AROMATIC POLYAMIDE CONTAINING N-PROPARGYL GROUPS Patent
Terry L. St.Clair, James F. Wolfe (Virginia Polytechnic Inst. and State Univ.), and Thomas D. Greenwood, inventors (to NASA) (Virginia Polytechnic Inst. and State Univ.) Issued 26 Jul. 1983 5 p Filed 23 Oct. 1980 Supersedes N81-15107 (19 - 06, p 0727)
(NASA-Case-LAR-12723-1; NAS 1.71:LAR-12723-1;
US-Patent-4,395,540; US-Patent-Appl-SN-199768;
US-Patent-Class-528-345; US-Patent-Class-525-420;
US-Patent-Class-528-183; US-Patent-Class-528-192;
US-Patent-Class-528-220; US-Patent-Class-528-336) Avail: US Patent and Trademark Office CSCL 11B

A composition and method are disclosed for increasing the use temperature of polyamides based on the incorporation of a latent crosslinking agent into the polymer backbone, wherein high temperature performance is achieved without sacrificing solubility or processability.
Official Gazette of the U.S. Patent and Trademark Office

N85-20124* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR PREPARING SOLVENT RESISTANT, THERMOPLASTIC AROMATIC POLY(IMIDESULFONE) Patent
Terry L. St.Clair and David A. Yamaki, inventors (to NASA) Issued 18 Dec. 1984 6 p Filed 6 May 1983 Supersedes N83-29391 (21 - 18, p 2900) Division of US Patent No. 4,398,021, US Patent Appl. SN-407240, filed 11 Aug. 1981
(NASA-Case-LAR-12858-2; NAS 1.71:LAR-12858-2;
US-Patent-4,489,027; US-Patent-4,398,021;
US-Patent-Appl-SN-492282; US-Patent-Appl-SN-407240;
US-Patent-Class-264-137; US-Patent-Class-264-112;
US-Patent-Class-264-120; US-Patent-Class-264-152;
US-Patent-Class-264-258; US-Patent-Class-264-331.12;
US-Patent-Class-264-331.19; US-Patent-Class-264-DIG.65;
US-Patent-Class-528-226; US-Patent-Class-528-239;
US-Patent-Class-528-241; US-Patent-Class-528-258;
US-Patent-Class-528-279) Avail: US Patent and Trademark Office CSCL 11B

A process for preparing a thermoplastic poly(midesulfone) is disclosed. This resulting material has thermoplastic properties which are generally associated with polysulfones but not polyimides, and solvent resistant which is generally associated with polyimides but not polysulfones. This system is processable in the 250 to 350 C range for molding, adhesive and laminating applications. This unique thermoplastic poly(imidesulfone) is obtained by incorporating an aromatic sulfone moiety into the backbone of an aromatic linear polyimide by dissolving a quantity of a 3,3',4,4'-benzophenonetetracarboxylic dianhydride (BTDA) in a solution of 3,3'-diaminodiphenylsulfone and bis(2-methoxyethyl)ether, precipitating the reactant product in water, filtering and drying the recovered poly(amide-acid sulfone) and converting it to the poly(imidesulfone) by heating.
Official Gazette of the U.S. Patent and Trademark Office

N85-20125* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HOT MELT ADHESIVE ATTACHMENT PAD Patent
Robert L. Fox, Alan W. Frizzill, Bruce D. Little, Donald J. Progar, Robert H. Coultrip, Richard H. Couch, John R. Gleason, Bland A. Stein, John D. Buckley, and Terry L. St.Clair, inventors (to NASA) Issued 18 Dec. 1984 10 p Filed 22 Jul. 1983 Supersedes N83-34044 S(21 - 22, p 3605)
(NASA-Case-LAR-12894-1; NAS 1.71:LAR-12894-1;
US-Patent-4,488,335; US-Patent-Appl-SN-516087;
US-Patent-Class-24-304; US-Patent-Class-24-447;
US-Patent-Class-24-450; US-Patent-Class-24-693;
US-Patent-Class-156-273.7) Avail: US Patent and Trademark Office CSCL 11A

A hot melt adhesive attachment pad for releasably securing distinct elements together is described which is particularly useful in the construction industry or a spatial vacuum environment. The attachment pad consists primarily of a cloth selectively impregnated with a charge of hot melt adhesive, a thermo-foil heater, and a thermo-cooler. These components are securely mounted in a mounting assembly. In operation, the operator activates the heating cycle transforming the hot melt adhesive to a substantially liquid state, positions the pad against the attachment surface, and activates the cooling cycle solidifying the adhesive and forming a strong, releasable bond.
Official Gazette of the U.S. Patent and Trademark Office

N85-20126* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INSULATION BONDING TEST SYSTEM Patent
James M. Beggs, Garland D. Johnston, Archie D. Coleman, Joseph N. Portwood, Jerry M. Saunders, John W. Redmon, and Allen C. Porter, inventors (to NASA) (Teledyne Brown Engineering Co., Huntsville, Ala.) Issued 30 Oct. 1984 9 p Filed 10 Feb. 1983 Supersedes N83-19903 (21 - 10, p 1489)
(NASA-Case-MFS-25862-1; NAS 1.71:MFS-25862-1;
US-Patent-4,479,386; US-Patent-Appl-SN-465366;
US-Patent-Class-73-582; US-Patent-Class-73-579;
US-Patent-Class-73-588) Avail: US Patent and Trademark Office CSCL 11G

A method and a system for testing the bonding of foam insulation attached to metal is described. The system involves the use of an impacter which has a calibrated load cell mounted on a

plunger and a hammer head mounted on the end of the plunger. When the impacter strikes the insulation at a point to be tested, the load cell measures the force of the impact and the precise time interval during which the hammer head is in contact with the insulation. This information is transmitted as an electrical signal to a load cell amplifier where the signal is conditioned and then transmitted to a fast Fourier transform (FFT) analyzer. The FFT analyzer produces energy spectral density curves which are displayed on a video screen. The termination frequency of the energy spectral density curve may be compared with a predetermined empirical scale to determine whether a igh quality bond, good bond, or debond is present at the point of impact.

Official Gazette of the U.S. Patent and Trademark Office

N85-20127*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE ROLE OF SILVER IN SELF-LUBRICATING COATINGS FOR USE AT EXTREME TEMPERATURES

Harold E. Sliney 1985 20 p refs To be presented at the Ann. Meeting of the Am. Soc. of Lubrication Engr., Las Vegas, Nev., 6-9 May 1985

(NASA-TM-86943; E-2428; NAS 1.15:86943) Avail: NTIS HC A02/MF A01 CSCL 11H

The advantages and disadvantages of elemental silver as a tribological material are discussed. It is demonstrated that the relatively high melting point of 961 deg C, softness, marked plasticity, and thermochemical stability of silver combine to make this metal useful in thin film solid lubricant coatings over a wide temperature range. Disadvantages of silver during sliding, except when used as a thin film, are shown to be gross ploughing due to plastic deformation under load with associated high friction and excessive transfer to counterface surfaces. This transfer generates an irregular surface topography with consequent undesirable changes in bearing clearance distribution. Research to overcome these disadvantages of element silver is described. A comparison is made of the tribological behavior of pure silver with that of silver formulated with other metals and high-temperature solid lubricants. The composite materials are prepared by co-depositing the powdered components with an airbrush followed by furnace heat treatment or by plasma-spraying. Composite coatings were formulated which are shown to be self-lubricating over repeated, temperature cycles from low temperature to about 900 deg C.

R.J.F.

N85-20128*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PROCESS FOR PREPARING ESSENTIALLY COLORLESS POLYIMIDE FILM CONTAINING PHENOXY-LINKED DIAMINES Patent Application

Anne K. St.Clair and Terry L. St.Clair, inventors (to NASA) Filed 23 Aug. 1984 23 p

(NASA-Case-LAR-13353-1; NAS 1.71:LAR-13353-1; US-Patent-Appl-SN-643524) Avail: NTIS HC A02/MF A01 CSCL 11B

A polyimide film that is approximately 90% transparent at 500 nm, useful for thermal protective coatings and solar cells, and the processes for preparing the same by thermal and chemical conversion are disclosed. An essential feature for achieving maximum optical transparency films requires utilizing recrystallized and/or sublimated specific aromatic diamines and dianhydride monomers and introducing phenoxy or thiophenyl separator groupps and isomeric m,m'- or o,p'-oriented diamines into the polymer molecular structure. The incorporation of these groups in the polymer structure serves to separate the chromaphoric centers and reduce the formation of inter-chain and intra-chain charge transfer complexes which normally cause absorptions in the UV-visible range. The films may be obtained by hand, brushing, casting or spraying a layer of the polyamic acid solutions onto a surface and thermally converting the applied layer to the polyimide. In addition, the polyamic acid solution can be chemically converted to the polyimide, subsequentially dissolved in an organic solvent, and applied as a polyimide film layer with the solvent therein thermally removed. NASA

N85-20129*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OXIDATION PROTECTION COATINGS FOR POLYMERS Patent Application

M. J. Mirtich, B. A. Banks, and J. S. Sovey, inventors (to NASA) Filed 11 Sep. 1984 11 p

(NASA-Case-LEW-14072-1; NAS 1.71:LEW-14072-1; US-Patent-Appl-SN-649330) Avail: NTIS HC A02/MF A01 CSCL 11B

A polymeric substrate is coated with a metal oxide film to provide oxidation protection in low earth orbital environments. The film contains about 4 volume percent polymer to provide flexibility. A coil of polymer material moves through an ion beam as it is fed between reels. The ion beam irst cleans the polymer material surface and then sputters the film material from a target onto this surface. NASA

N85-20130# Argonne National Lab., Ill.

STRUCTURAL CERAMICS IN TRANSPORTATION: FUEL IMPLICATIONS AND ECONOMIC IMPACTS

Arvind P. S. Teotia and Larry R. Johnson 1985 23 p refs Presented at the 64th Ann. Transportation Res. Board Meeting, Washington, 21 Jan. 1985

(Contract W-31-109-eng-38)

(DE85-003024; CONF-850115-4) Avail: NTIS HC A02/MF A01

The potential application of structural ceramics in motor vehicle engines is described. The high temperature strength characteristic plus the properties of resistance to wear and corrosion make these high tech ceramics excellent candidates for the harsh environment of the advanced engine systems being considered for automobiles and trucks. The critical role of ceramics in the adiabatic diesel, gas turbine and Stirling engine is discussed, along with an indication of the fuel efficiency potential and multifuel capability of each engine. A market penetration analysis of the advanced engines is reviewed and forms the basis of developing two alternative commercialization scenarios for ceramic component engines - one with the United States dominating the market and the other with Japan dominating. Changes in major national economic indicators are noted after simulating the economy with a macroeconomic model. Strategic materials impacts are also noted. DOE

N85-20131# California Univ., Livermore. Lawrence Livermore Lab.

POLYMER BLENDS AS HIGH EXPLOSIVE BINDERS

D. Mark Hoffman and Leonard B. Caley 5 Oct. 1984 32 p refs Presented at the Ann. DOE Adhesives Symp., Kansas City, Mo., 19 Jun. 1984

(Contract W-7405-eng-48)

(DE85-001210; UCRL-90603; CONF-8406219-1) Avail: NTIS HC A03/MF A01

One approach to high-density, high-modulus binders for explosives is to blend low-density, high-modulus polymers with high-density, low-modulus polymers. Improved properties, which miscible pairs theoretically should have, are discussed. Two attempts to achieve miscibility between a high-density fluoropolymer (Kel-F 800) and high-modulus thermoplastics (Lucite 130 and Phenoxy PPKHJ) were unsuccessful. These blends are immiscible and their physical properties are additive or not significantly enhanced. Anelastic properties of the blends indicate phase separation by the presence of two glass transitions, one associated with each phase. Unfortunately, neither of these pairs has merit as an improved plastic-bonded explosive binder. However, a compatible (miscible) pair would be an improved binder if the appropriate polymer pair could be found. DOE

N85-20132# Oak Ridge National Lab., Tenn. Metals and Ceramic Div.

FABRICATION OF FIBER-REINFORCED CERAMIC COMPOSITES BY CHEMICAL VAPOR INFILTRATION

A. J. Caputo and W. J. Lackey Oct. 1984 27 p refs

(Contract DE-AC05-84OR-21400)

(DE85-003809; ORNL/TM-9235) Avail: NTIS HC A03/MF A01

Ceramic fiber-ceramic matrix composites are of interest because of their potentially higher strength and toughness. A vacuum forming technique was used to fabricate low-density structures from SiC fibers. These fibrous structures were then infiltrated by chemical vapor deposition. Matrices of Si3N4 and SiC were deposited. DOE

N85-20133# California Univ., Livermore. Lawrence Livermore Lab.
AB INITIO CALCULATIONS OF THE OPTICAL PROPERTIES OF IONS IN GLASS
M. J. Weber Aug. 1984 16 p refs Presented at Symp. on Glass Sci. and Technol., Probl. and Prospects for 2004, Vienna, 1 Jul. 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE85-001008; UCRL-91384; CONF-840745-2) Avail: NTIS HC A02/MF A01

There is interest in the optical properties of ions in insulating glasses for various applications. The task of predicting optical properties of ions in glass from first principles given only the physics of the constituent atoms is discussed. The prospects for developing such ab initio-computation procedures are gleaned from examining the progress made in understanding the properties of dopant ions in crystals. It is probable that in 20 years, there will be reliable procedures for predicting optical properties of ions in crystals, but the development of corresponding procedures for complex glasses is a herculean task. The use of computer simulations is addressed. DOE

N85-20134# Oak Ridge National Lab., Tenn.
SANS STUDIES OF POLYMERS
G. D. Wignall Oct. 1984 11 p refs Presented at Symp. on Polymer Res. at Synchrotron Radiation Sources, Upton, N.Y., 29 Oct. 1984
(Contract DE-AC05-84CE-21400)
(DE85-002471; CONF-8410112-1) Avail: NTIS HC A02/MF A01

Before small-angle neutron scattering (SANS), chain conformation studies were limited to light and small angle X-ray scattering techniques, usually in dilute solution. The SANS from blends of normal and labeled molecules could give direct information on chain conformation in bulk polymers. Water-soluble polymers may be examined in H2O/D2O mixtures using contrast variation methods to provide further information on polymer structure. Information provided by this technique is reviewed using examples of experiments performed at the National Center for Small-Angle Scattering Research. DOE

N85-20135# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
LASER PROCESSING OF CERAMICS Progress Report, 1 Aug. 1983 - 31 Jul. 1984
G. L. Messing 15 Aug. 1984 162 p refs
(Contract DE-AC02-81ER-10949)
(DE85-001184; DOE/ER-10949/T1) Avail: NTIS HC A08/MF A01

Progress is reported in three areas of research: (1) rapid solidification of alumina zirconia ceramics; (2) laser induced sintering; and (3) rapid solidification processing of alumina silica melts. The first study has been concluded. The second and third areas of research set the foundation for more extensive research in these areas. The preliminary analysis of thermal stress indicates the laser induced sintering is quite feasible when the power intensity and input are controlled. Otherwise, the expected catastrophic effect is observed. Finally, microstructural effects of rapid solidifications of Al2O3-SiO2 melts around the mullite composition were examined by TEM and X-ray diffraction. DOE

N85-20136# Stanford Univ., Calif. Lab. of Physics.
EVALUATION OF MACHINING DAMAGE IN BRITTLE MATERIALS Final Report
B. T. Khuri-Yakub Sep. 1984 5 p refs
(Contract DE-AT03-83ER-45020)
(DE85-001794; DOE/ER-45020/T1; SU-GL-3770) Avail: NTIS HC A02/MF A01

An acoustic surface wave measurement technique was developed to find and size machining damage and surface cracks in hot pressed silicon nitride (Norton's NC-132). The measurement technique consists of exciting a leaky surface wave on the sample while immersed in a water tank. The transducer is pulse excited and operates at a frequency of 50 MHz. The signal from surface cracks is digitized and stored in a minicomputer. A reference signal from a 90 deg corner in the sample is also digitized and stored in the minicomputer. The scattering coefficient of the crack as a function of frequency is then calculated by dividing the crack signal by the reference signal via a Wiener filter. DOE

N85-20137# California Univ., Livermore. Lawrence Livermore Lab.
DYNAMIC COMPACTION OF POWDERS
W. G. Hoover 11 Jun. 1984 20 p refs Presented at the ISPRA EURATOM School on Computer Simulation in Phys. Met., Ispra, Italy, 21 May 1984
(Contract W-7405-eng-48)
(DE85-001062; UCRL-90903; CONF-8405247-1) Avail: NTIS HC A02/MF A01

The potential importance of dynamic compaction, coupled with the sophistication required for effective modeling, makes dynamic compaction an exciting area of physics right now. In particular, microscopic modeling of surface-surface interactions, and mesoscopic modeling of sintering, deformation, and cold welding should have useful impact on the macroscopic models required to help design physics experiments and refine commercial powder processes. Finite difference simulations of dynamic compaction were carried out. DOE

N85-20138# Sandia Labs., Albuquerque, N. Mex.
ACCELERATED AGING OF ALUMINIZED ACRYLIC SOLAR MIRROR MATERIALS
A. R. Mahoney, R. B. Pettit, and G. S. Kinoshita Oct. 1984 19 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002683; SAND-84-0532) Avail: NTIS HC A02/MF A01

The accelerated aging characteristics of an aluminized acrylic reflector material (3M Company ECP-244) were studied when bonded to either an aluminum or acrylic painted steel substrate. The aging consisted of temperature/humidity cycling between extremes of 54(0) to -29(0)C. After 255 days of environmental chamber exposure, the solar averaged specular reflectance values for both types of samples indicated no degradation, within experimental errors. Therefore, the acrylic painted steel substrate appears to be a suitable substitute for a sheet aluminum substrate. DOE

N85-20139# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
HIGH TEMPERATURE CORROSION OF CERAMICS Progress Report, 15 Jun. 1983 - 14 Jun. 1984
J. R. Blachere and F. S. Pettit Feb. 1984 99 p refs
(Contract DE-AC02-81ER-10915)
(DE85-002179; DOE/ER-10915/3; SETEC-MME-021) Avail: NTIS HC A05/MF A01

The hot corrosion of high purity and impure silicon nitride and silicon carbide at 1000 C in SO2-SO3-O2 and oxygen atmospheres was studied. Results are in good agreement with published data, in particular for the degrading influence of impurities on the oxidation resistance of silicon nitride and silicon carbide. However the morphology and thickness of the crystalline oxide formed on the single crystal SiO did not differ significantly for the silicon side or the carbon side. No reaction was observed between high purity silicon nitride or silicon carbide and SO3 in SO3-SO2-O2 mixture at 1000 C. No significant impurity concentration was found in the oxide layers formed at 1000 C. Sulfates formed with some impurities when concentrated in the oxide layer during prior oxidation at 1400 C. With Na2SO4 deposits in SO3-containing atmospheres little hot corrosion was observed for the high purity Si3N4 and SiC. DOE

N85-20140# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CHARACTERIZATION OF THE NETWORK STRUCTURE OF A HARDENED EPOXY RESIN (TGMDA/DDS SYSTEM) [CARACTERISATION DE LA STRUCTURE DU RESEAU DUNE RESINE EPOXY DURCIE (SYSTEME TGMDA/DDS)]
B. Bloch Apr. 1984 146 p refs In FRENCH
(Contract DRET-83.34.133)
(ONERA-RT/3/3346/M) Avail: NTIS HC A07/MF A01

Techniques for investigating the molecular structure of a thermosetting resin after polymerization were tested. Infrared spectroscopy with Fourier transformation, high resolution nuclear magnetic resonance (NMR) of C13 and N15 in solution and solid state, electron paramagnetic resonance, and scanning electron microscope were studied. Results show that NMR provides the most information, although the techniques are complementary.
Author (ESA)

N85-20141# Charles River Associates, Inc., Boston, Mass.
TECHNOLOGICAL AND ECONOMIC ASSESSMENT OF ADVANCED CERAMIC MATERIALS. VOLUME 3: A CASE STUDY OF CERAMIC CAPACITORS Final Planning Report
Aug. 1984 90 p refs
(Contract NB82-SBCA-1637)
(PB85-113108; CRA-684-Vol-3; NBS/GCR-84/470/3-Vol-3; Planning/Rept-19) Avail: NTIS HC A05/MF A01; also available in set of 6 reports HC E99 as PB85-113074 CSCL 11B

The technologies used in producing ceramic capacitor are discussed. The U.S. multilayer ceramic capacitor industry is analyzed. The economic benefits of anticipated future technological advance in multilayer ceramic capacitors are reviewed. The major findings of the study, including a discussion of the primary measurement related barriers, was presented. GRA

N85-20142# Northwestern Univ., Evanston, Ill.
STRUCTURAL BASIS FOR THE MECHANICAL PROPERTIES OF POLYETHLENES Final Report, Dec. 1981 - May 1984
S. H. Carr, B. Crist, and T. J. Marks Sep. 1984 40 p refs
(Contract GRI-5081-260-0538)
(PB85-149771; GRI-84/0171) Avail: NTIS HC A03/MF A01 CSCL 11I

The physical properties of polyethylene, the material used in gas distribution pipes and fittings, are ultimately determined by the nature of the polymer molecules in the resin used for pipe manufacture. This relation between molecular structure and properties is based on the morphology formed in the polyethylene by a particular processing history. Model polyethylenes having a very narrow molecular weight distributions and well defined levels of short chain branching and long chain branching have been used to quantify the effects of mechanical behavior, especially those related to fracture. Tensile deformation of unnotched and notched samples was done to assess the relevant tensile and fracture toughness parameters. It has been demonstrated that a critical molecular weight is required for the attainment of good ductility and fracture toughness. GRA

N85-20014# Joint Publications Research Service, Arlington, Va.
OVERVIEW OF MAJOR SWEDISH INSTITUTIONS IN POLYMER RESEARCH
Per Rydgren *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 1-8 Transl. into ENGLISH from Plastforum Scand. (Sweden), no. 10, 1984 p 64-68 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

N85-20051# Joint Publications Research Service, Arlington, Va.
NEW METHOD FOR STUDYING SURFACE CRACK GROWTH IN LAMINATED POLYMER COMPOSITE MATERIALS Abstract Only
M. E. Chaplya and N. M. Gvozcyuk *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 12 Transl. into ENGLISH from Fiz.-Khim. Mekhan. Mater. (USSR), v. 20, no. 1, Jan. - Feb. 1984 p 84-87 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20085# Joint Publications Research Service, Arlington, Va.
BENDING TWO-LAYER METAL-POLYMER PLATES Abstract Only
E. N. Starovoytov and T. A. Starovoytova *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 57 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 3, Mar. 1984 p 100-104 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-20143# Committee on Energy and Commerce (U. S. House).
SYNTHETIC FUELS POLICY
Washington GPO 1984 472 p refs Hearings before the Subcomm. on Fossil and Synthetic Fuels of the Comm. on Energy and Com., 98th Congr., 1st and 2nd Sess., 4-5 Oct. 1983, 25 Jan., 18 Jun. 1984
(GPO-34-227) Avail: Subcommittee on Fossil and Synthetic Fuels

The Energy Security Act was re-examined with special focus on synthetic fuel development. The present trend in oil prices is toward stability, energy consumption is being reduced, and energy efficiency gains are increasing. Long term predictions and goals were also discussed. B.G.

N85-20144# Naval Research Lab., Washington, D. C.
QUANTITATIVE DETERMINATION OF COMPOUND CLASSES IN JET TURBINE FUELS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY/DIFFERENTIAL REFRACTIVE INDEX DETECTION: PART 2 Interim Report, Jun. 1983 - Jun. 1984
C. W. Sink, D. R. Hardy, and R. N. Hazlett 31 Dec. 1984 16 p
(Z03-88)
(AD-A149298; NRL-MR-5497-Pt-2) Avail: NTIS HC A02/MF A01 CSCL 21/4

Recent investigations demonstrated the usefulness of high performance liquid chromatography/differential refractive index detection (HPLC/DRI) as a method for quantitating compound classes present in jet fuels. The method is fast, precise and accurate when applied to mixtures of known compounds typical of each compound class encountered in a fuel. It is also accurate when the refractive index of the fuels class and the detector calibration standard are matched. This study assesses the accuracy of HPLC/DRI when the calibration standards are pure compound blends whose refractive index for each compound class is matched closely to that of the fuels being analyzed. The accuracy of analyses by this method of calibration was checked by analyzing test fuels of known refractive indices. The test fuels were prepared by recombination of previously separated fuels after measuring the refractive index of each fraction. The composition of fifteen fuels was also determined by the Fluorescent Indicator Absorption (FIA) method (ASTM-D-1319-77). In general the agreement between FIA and HPLC/DRI was quite good for many samples after conversion of the FIA aromatic content to weight percent. Four fuels, three of which have unusually high dicyclic aromatic content did not give good agreement between the two methods of analysis. The results demonstrate that it is possible to accurately calibrate the detector's response factors for each compound class by standards derived from pure compounds. To ensure that the accuracy of the results falls within the limits of the electronic integrator's precision, one needs to match the refractive index of the saturate fraction to within approximately 0.004 RI units. GRA

N85-20145# Naval Surface Weapons Center, White Oak, Md.
CHEMICAL AND PHOTOGRAPHIC EVALUATION OF RIGID EXPLOSIVE TRANSFER LINES Interim Report, Jul. 1980 - May 1984
E. G. Kayser May 1984 52 p Original contains color illustrations
(AD-A149303; NSWC/TR-84-66) Avail: NTIS HC A04/MF A01 CSCL 19/1

This paper describes the chemical and photographic analyses performed on 112 explosive transfer lines used to initiate aircraft emergency escape systems for a variety of military and NASA aircraft. The purpose was to provide quantitative chemical data on in-service explosive transfer lines as affected by both age and heat treatment. These data are necessary in order to make reliable, responsible, and conservative estimations of inservice cord life extension. The approach was to: (1) develop a test methodology; (2) characterize the types of transfer lines in use in this country; (3) analyze these lines following a repeat of the thermal tests conducted in the original qualification; and (4) conduct a degradation investigation on the explosives currently in use. The results of this testing indicate that rigid explosive transfer lines are not adversely affected by age, service, or a repeat of the thermal qualification tests. Author (GRA)

N85-20146# Los Alamos Scientific Lab., N. Mex. Detonation Systems Development Div.
DESIGN OF EXPLOSIVE LOGIC ELEMENTS
W. H. Meyers 1984 18 p Presented at the 12th Symp. on Explosives and Pyrotechnics, San Diego, Calif., 13-15 Mar. 1984
(Contract W-7405-eng-36)
(DE84-009611; LA-UR-84-392; CONF-840383-2) Avail: NTIS HC A02/MF A01

Explosive logic systems were exposed to see if they might provide advantages in weapon safety or weapon command and control. The extrudable explosive EXTEX (80% PETN, 20% Sylgard) was used. These systems contain at least one but usually several discrete dependent on the reliability of these elements. The troubles encountered in the early attempts to use explosives logic are attributed to the lack of a truly reliable design for one or more of the elements used. The need for a safety/reliability window is expressed. The development of three elements for which working windows are available is discussed. DOE

N85-20147# Midwest Research Inst., Golden, Colo. Solar Research Inst.
ETHANOL PRODUCTION BY ENZYMATIC HYDROLYSIS: PARAMETRIC ANALYSIS OF A BASE-CASE PROCESS
Steven H. Isaacs May 1984 74 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013105; SERI/TR-231-2093) Avail: NTIS HC A04/MF A01

A base case flowsheet for an enzymatic hydrolysis process is presented. Included is a parametric sensitivity analysis to identify key research issues and an assessment of this technology. The plant discussed is a large scale facility, producing 50 million gallons of ethanol per year. The plant design is based on the process originally conceived by the US National Army Command and consists of these process steps: pretreatment; enzyme production; enzyme hydrolysis; fermentation; and distillation. The base case design parameters are based on recent laboratory data from Lawrence Berkeley Laboratories and the University of California at Berkeley. The selling price of ethanol is used to compare variations in the base case operating parameters, which include hydrolysis efficiencies, capital costs, enzyme production efficiencies, and enzyme recycle. DOE

N85-20148# California Univ., Livermore. Lawrence Livermore Lab.
THE RESPONSE OF EXPLOSIVE SYSTEMS TO THERMAL STIMULI: A STATE-OF-THE-ART ASSESSMENT
Raymond R. McGuire 25 Sep. 1984 10 p
(Contract W-7405-eng-48)
(DE85-000919; UCID-20177) Avail: NTIS HC A02/MF A01

State of the art methods for determining the response of explosive systems to thermal stimuli are assessed. The assessment was made by visiting a number of organizations and interviewing key researchers in the field. The questions and some of the answers are listed. DOE

N85-20149# California Univ., Livermore. Lawrence Livermore Lab.
DOE HAZARD CLASSIFICATION FOR INSENSITIVE HIGH EXPLOSIVES (IHE)
R. R. McGuire and R. P. Guarienti Aug. 1984 7 p Presented at the DOE Hazard Classification for Insensitive High Explosives Conf., Houston, 28-30 Aug. 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE84-017002; UCRL-91420; CONF-840896-1) Avail: NTIS HC A02/MF A01

The DOE has adopted a hazard classification of insensitive high explosives (IHE) and IHE subassembly based on the premise of no probability of initiation and has proposed a test protocol for that classification based on an in depth understanding of the hazards involved and the response of the energetic material to relevant stimuli. These classifications are reviewed herein. DOE

N85-20150# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
STUDY OF HTPB-BASED SOFRAM FUELS
Ralf Eliasson Nov. 1984 53 p refs In SWEDISH; ENGLISH summary
(FOA-C-20563-D3; ISSN-0347-3694) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm KR 50

In a small Solid Fuel Ramjet (SOFRAM) test engine, burning rate and combustion efficiency for different HTPB - based fuels were studied, using tubular fuel charges with an external diameter of 72 mm. Ram air temperature and chamber pressure, simulating different flight conditions were varied, as well as chamber geometry. It is found that additions of aluminum (30 %), magnesium (30 %), or ammonium perchlorate (10 % to 30 %) to HTPB increase the burning rate; however high content of AP or addition of iron oxide (1 %) increases risk of pressure oscillations. Addition of carbon black (5 %) to HTPB decreases the burning rate. Combustion efficiency increases with chamber pressure or when the air flow through the engine increases at constant ram air temperature and constant chamber pressure. Author (ESA)

N85-20151# Oklahoma Univ., Norman. School of Chemical Engineering and materials Science.
MEASUREMENT OF GAS COMPRESSIBILITY FACTOR DATA FOR NATURAL GAS AND SYNTHETIC GAS COMPONENTS AND THEIR MIXTURES Annual Report, Apr. 1983 - Mar. 1984
R. T. Ellington, K. E. Starling, K. H. Kumar, V. Oswal, T. Pham, J. Zakaria, M. Hill, and S. Narayanan May 1984 25 p refs Sponsored by Gas Research Inst.
(PB85-129047; GRI-84/0095) Avail: NTIS HC A02/MF A01 CSCL 21D

High accuracy compressibility data were sought on natural and synthetic gas components. A Burnett-type P-V-T cell was set up with auxiliaries and calibrated by use of the best nitrogen data available. The internally consistent mixture second virials should assist determination of interactions for correlation development. Equipment was set up for gravimetric preparation of mixtures to new tests. Software is being developed for automation of the equipment. R.S.F.

N85-20152# Midwest Research Inst., Golden, Colo.
SOLAR FUEL SYNTHESIS BASED ON COLLOIDAL AND PARTICULATE SEMICONDUCTORS Annual Report, 1 Aug. 1983 - 31 Jul. 1984
A. J. Frank and M. Graetzel (Ecole Polytechnique Federale de Lausanne) 15 Aug. 1984 59 p refs Sponsored by Gas Research Inst.
(PB85-129104; GRI-84/0173) Avail: NTIS HC A04/MF A01 CSCL 21D

Colloidal and particulate semiconductors have been investigated for the photodecomposition of water to hydrogen and oxygen. To advance the basic understanding of dispersed semiconductors, information is obtained on particle size effects, energetics and dynamics of interfacial charge transfer, photostability, catalytic activity, and effects of surface modification. A broad range of low bandgap materials (PIS2, OsSe2, PdPS, MoS2, WSe2, Fe2O3, etc.) were investigated. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-20153* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEPOSITION OF DIAMONDLIKE CARBON FILMS Patent
Michael J. Mirtich, James S. Sovey, and Bruce A. Banks, inventors (to NASA) Issued 25 Dec. 1984 6 p Filed 9 Jul. 1984 Supersedes N84-28986 (22 - 19, p 2996)
(NASA-Case-LEW-14080-1; NAS 1.71:LEW-14080-1; US-Patent-4,490,229; US-Patent-Appl-SN-628866; US-Patent-Class-204-192C; US-Patent-Class-204-192R; US-Patent-Class-204-192SP; US-Patent-Class-423-414; US-Patent-Class-423-445; US-Patent-Class-423-446; US-Patent-Class-423-449; US-Patent-Class-423-DIG.10) Avail: US Patent and Trademark Office CSCL 13H

A diamondlike carbon film is deposited in the surface of a substrate by exposing the surface to an argon ion beam containing a hydrocarbon. The current density in the ion beam is low during initial deposition of the film. Subsequent to this initial low current condition, the ion beam is increased to full power. At the same time, a second argon ion beam is directed toward the surface of the substrate. The second ion beam has an energy level much greater than that of the ion beam containing the hydrocarbon. This addition of energy to the system increases mobility of the condensing atoms and serves to remove lesser bound atoms.
Official Gazette of the U.S. Patent and Trademark Office

N85-20154*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NEBULIZATION REFLUX CONCENTRATOR Patent Application
Vernon G. Collins (Coll. of William and Mary) and Wesley R. Cofer, III, inventors (to NASA) Filed 5 Nov. 1984 14 p
(NASA-Case-LAR-13254-1; NAS 1.71:LAR-13254-1; US-Patent-Appl-SN-668432) Avail: NTIS HC A02/MF A01 CSCL 13H

A nebulization reflux concentrator for removing trace gas contaminants from a sample gas is described. Sample gas from a gas supply is drawn by a suction source into a vessel. The gas enters vessel through an atomizing nozzle, thereby atomizing and entraining a scrubbing liquid solvent drawn through siphon tube from a scrubbing liquid reservoir. The gas and entrained liquid rise through concentrator and impinge upon a solvent-phobic filter, whereby purified gas exits through the filter housing and contaminated liquid coalesces on the solvent-phobic filter and falls into reservoir. NASA

N85-20155*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS FOR PRODUCING DIAMOND-LIKE CARBON FLAKES Patent Application
Bruce A. Banks, inventor (to NASA) Filed 5 Nov. 1984 12 p
(NASA-Case-LEW-13837-3; NAS 1.71:LEW-13837-3; US-Patent-Appl-SN-668433) Avail: NTIS HC A02/MF A01 CSCL 13H

A vacuum are from a spot at the face of a graphite cathode to a graphite anode produces a beam of carbon ions and atoms. A carbon coating from this beam is deposited on an ion beam sputtered target to produce diamondlike carbon flakes. A graphite tube encloses the cathode, and electrical isolation is provided by an insulating sleeve. The tube forces the vacuum arc spot to be confined to the surface on the outermost end of the cathode. Without the tube the arc spot will wander to the side of the cathode. This spot movement results in low rates of carbon deposition, and the properties of the deposited flakes are more graphite-like than diamond-like. NASA

N85-20156*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEXTURED CARBON SURFACES ON COPPER Patent Application
Arthur N. Curren, Kenneth A. Jensen, and Robert F. Roman, inventors (to NASA) Filed 10 Oct. 1984 12 p
(NASA-Case-LEW-14130-1; NAS 1.71:LEW-14130-1; US-Patent-Appl-SN-659475) Avail: NTIS HC A02/MF A01 CSCL 13H

A very thin layer of highly textured carbon is applied to a copper surface by a triode sputtering process. A carbon target and a copper substrate are simultaneously exposed to an argon plasma in a vacuum chamber. The resulting carbon surface is characterized by a dense, random array of needle like spries or peaks which extend perpendicularly from the copper surface. The coated copper is especially useful for electrode plates in multistage depressed collectors. NASA

N85-20157# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
RESPONSE OF EARTH-COVERED SLABS IN CLAY AND SAND BACKFILLS Final Report
S. A. Kiger, P. S. Eagles, and J. T. Baylot Oct. 1984 76 p
(AD-A149296; WES/TR/SL-84-18) Avail: NTIS HC A05/MF A01 CSCL 13/13

Five tests were conducted, three static and two dynamic, on identical 2-foot-wide, one-way reinforced concrete slabs. Each slab was 2 feet long and had a span-to-effective-depth ratio of 10. Static test were conducted using water over a waterproof membrane to apply a uniform surface pressure with the test slabs surface flush, 1 foot deep in clay soil backfill, and 1 foot deep in a sand backfill. The clay and sand backfill conditions were repeated in the two dynamic tests. The reaction structure supporting the slabs was rigid enough to prevent any slab support rotation at the clamped edges. The rigid reaction structure also eliminated any inplane thrust generated by lateral earth pressures. Therefore, compressive membrane thrust was not a variable between the tests. The surface-flush static test slab failed at about 174 psi, failure in the static clay backfill test occurred at about 835-psi overpressure. The approximately fivefold increase in static capacity in the sand backfill was due to soil arching in the high-shear-strength sand backfill. Peak dynamic pressure in the dynamic sand backfill test was approximately 3,300 psi and in the dynamic clay backfill about 860 psi. These test results indicate that soil arching, both static and dynamic, is much more important than current calculations indicate at this very shallow burial depth. The dynamic tests approximately simulated 0.027- and 0.010-KT nuclear weapons at about 3,300- and 860-psi peak overpressures, respectively. Assuming a 16-foot prototype span, these weapons scale up to approximately 14 and 5 KT, respectively. GRA

N85-20158# Monsanto Research Corp., Miamisburg, Ohio.
CHEMICAL CLEANING OF 304 AND 304-L STAINLESS STEEL SURFACES BY THE NITRADD PASSIVATION PROCESS
Thomas M. Johnson 27 Nov. 1984 10 p ref
(Contract DE-AC04-76DP-00053)
(DE85-003714; MLM-3200) Avail: NTIS HC A02/MF A01

A chemical cleaning process was established to prepare 304 and 304-L stainless steel surfaces for welding operations. This process was adapted from an existing production procedure. The results of the two processes were compared by means of auger electron spectroscopy (AES). The AES data showed that the former process and the new process produce comparable results. Consequently, the process is a viable one and is being used to prepare specimens for welding experiments. DOE

N85-20159# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Section.
SIMULATION OF THE ELECTROCHEMICAL MACHINING PROCESS
L. J. Gray, C. A. Serbin, and W. C. Dietrich Nov. 1984 51 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003797; ORNL-6054) Avail: NTIS HC A04/MF A01

An algorithm for simulating a two dimensional electrochemical machining process is presented. A major part of the calculation, the solution of Laplace's equation, is accomplished by a boundary element method based upon Green's formula. Polarization, in the form of the Tafel equation, is included in the model. The computer program is discussed in detail. DOE

N85-20160# Los Alamos Scientific Lab., N. Mex. Group P-10.
SELECTION OF REGENERATOR GEOMETRY FOR MAGNETIC REFRIGERATOR APPLICATIONS
John A. Barclay and Sunil Sarangi 1984 33 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, La., 9-13 Dec. 1984
(Contract W-7405-eng-36)
(DE84-012637; LA-UR-84-1538; CONF-841201-9) Avail: NTIS HC A03/MF A01

In an effort to develop magnetic regenerators of high efficiency the following geometries were considered: (1) tube channels in solid block; (2) stack of perforated plates normal to the fluid flow direction; (3) stack of solid plates parallel to fluid flow direction, and packed bed of spherical particles; (4) loose packed; and (5) sintered. The overall efficiency of the regenerator, considering heat transfer, longitudinal conduction, and fluid pressure drop, was computed for all the above arrangements as a function of geometrical variables, such as overall length and particle diameter or plate thickness. The results yield the optimum geometry for a given combination of other controlling parameters, such as frequency, porosity, and fluid properties. The different geometries are compared under the constraint that the mass of magnetic material is the same for all. This condition is peculiar to the magnetic refrigeration process because the net refrigeration and driving forces are proportional to the mass of magnetic material. DOE

N85-20161# European Space Tribology Lab., Risley (England).
SEVEN-YEAR THERMAL-VACUUM REAL-LIFE TEST OF A SOLAR ARRAY DRIVE MECHANISM MANUFACTURED BY MARCONI SPACE AND DEFENCE SYSTEMS (MODEL NO. 002)
K. Parker Paris ESA Aug. 1984 63 p refs
(Contract ESA-4099/79/NL-PP)
(ESA-ESTL-62; ESA-CR(P)-1935) Avail: NTIS HC A04/MF A01

A solar array drive mechanism underwent 1 rev/day for 7 yr in an environmental test chamber. Angular rotation stability remains well within the specified limit. Slip-ring electrical noise increased substantially during the first 2 yr. There was then a small reduction during the following 3 yr followed by a small increase towards the end of the test. Several signal slip-ring circuits exceeded the nominal specified limit of 1 mV rms per ampere current. Two of the signal slip-ring circuits in the group carrying 500 mA current gave frequent noise transients of a very high value, indicating changes $>$ 1 ohm in the interface resistance. The distribution of these transients around the slip-rang circumference was not reproducible over long periods of time, indicating that they were probably due to the presence of variable amounts of wear debris. The noise across the power ring circuits remains well below the specified limit. Author (ESA)

N85-20162# Battelle Columbus Labs., Ohio.
CONTROL TECHNOLOGY FOR INTEGRATED CIRCUIT FABRICATION AT HONEYWELL OPTOELECTRONICS DIVISION, RICHARDSON, TEXAS
R. K. Smith and L. J. Ungers (PEDCo-Environmental, Inc., Cincinnati, Ohio) 3 Jul. 1984 15 p refs Sponsored in part by National Institute for Occupational Health and Safety
(PB85-109023; ECTB-115-17A) Avail: NTIS HC A02/MF A01 CSCL 06J

A walk through survey of the integrated circuit fabrication operation revealed that engineering controls consisted of general and local ventilation, and isolation enclosure of the epitaxy and gas cylinder storage areas. The gas storage room was maintained at a slight negative pressure and gas monitoring was conducted. Liquid wastes were segregated according to type. Acidic wastes were pumped to a drain that carried them to a waste treatment system where they were neutralized with sodium hydroxide. Organic wastes were placed in containers which were taken to an outdoor area behind the facility where they were emptied into drums for disposal. The facility had no routine industrial hygiene program. Smocks, gloves, and safety glasses were required in all fabrication areas. Respirators were available in case of emergency. Preplacement medical examinations were not administered. Quarterly urinalyses for arsenic (7440382) exposure were conducted on all employees performing sawing operations. GRA

N85-20163# Jensen Associates, Inc., Boston, Mass.
SOLAR-GAS SYSTEMS IMPACT ANALYSIS STUDY Final Report, Sep. 1982 - Jul. 1984
Charles P. Neill, Elaine F. Hahn, John C. Loose, Ted E. Poe, Alan S. Hirshberg, Steve Haas, Bruce Preble, and Jack Halpin Jul. 1984 189 p Sponsored by Gas Research Inst. Prepared in cooperation with Booz-Allen and Hamilton, Inc., Bethesda, Md.
(PB85-129088; GRI-84/0129) Avail: NTIS HC A09/MF A01 CSCL 13A

The impacts of solar/gas technologies on gas consumers and on gas utilities were measured separately and compared against the impacts of competing gas and electric systems in four climatic regions of the U.S. A methodology was developed for measuring the benefits or penalties of solar/gas systems on a combined basis for consumers sand distribution companies. It is shown that the combined benefits associated with solar/gas systems are generally greatest when the systems are purchased by customers who would have otherwise chosen high-efficiency electric systems (were solar/gas systems not available in the market place). The role of gas utilities in encouraging consumer acceptance of solar/gas systems was also examined ion a qualitative fashion. A decision framework for analyzing the type and level of utility involvement in solar/gas technologies was developed.
Author (GRA)

N85-20164# Battelle Columbus Labs., Ohio.
RESEARCH ON HEAT-EXCHANGER CORROSION Interim Report, May 1983 - Aug. 1984
R. Razgaitis, J. H. Payer, G. H. Stickford, E. L. White, S. G. Talbert, R. A. Cudnick, D. W. Locklin, and C. A. Farnsworth (American Gas Association Labs.) Sep. 1984 320 p refs Sponsored in part by Gas Research Inst.
(PB85-126316; GRI-84/0157; N4250-0500-1) Avail: NTIS HC A14/MF A01 CSCL 13A

Research conducted to develop technology for selecting corrosion resistant materials in high efficiency, gas fired, residential space heating equipment is reported. The methodology and results of sampling in over 500 homes to statistically characterize the corrosivity of flue gas condensate are described. The corrosion resistance of over 40 metal alloys was evaluated in accelerated laboratory tests with specimens exposed to an alternate wet/dry environment using chloride spiked condensate. A wide range of corrosion was observed, fron no corrosion to severe attack. Some stainless steels exhibited essentially complete resistance to attack in all corrosion modes evaluated. The results to date provide interim guidance to equipment manufacturers in the selection of materials for condensing equipment. GRA

N85-20165# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
26 Feb. 1985 62 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-009) Avail: NTIS HC A04/MF A01

Research developments in the area of machine tool construction are presented in this East Europe report. The utilization of

robotics and microelectronics technology in industrial production is described. For individual titles, see N85-20166 through N85-20173.

N85-20166# Joint Publications Research Service, Arlington, Va.
ROBOT PRODUCTION LINES IN OPERATION c37
In its East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 1-2 refs Transl. into ENGLISH from Otlet (Budapest), 13 Dec. 1984 p 37 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

Bulgaria today occupies a leading place within CEMA in the development of mechanical machine manufacture and electronics. Two larger lines of products were manufactured in the Beroe factory. The first contains non-digital robots, mostly lifting robots, used to perform relatively simple operations. The other series consists of the so-called flexible, electronically controlled robots, which are suitable for performing a number of work phases. Robot applications and marketing strategies are covered. B.W.

N85-20167# Joint Publications Research Service, Arlington, Va.
INSTITUTE DIRECTOR SURVEYS INDUSTRIAL AUTOMATION DRIVE
E. Gottschalk *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 3-11 Transl. into ENGLISH from Fertigunstech. und Betr. (East Berlin), v. 34, no. 10, 1984 p 583-585 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

Research and industrial development goals in the area of heavy machinery and equipment construction are discussed. The application of robot technology in this area is a major objective. B.W.

N85-20168# Joint Publications Research Service, Arlington, Va.
DEVELOPMENTS IN GDR METAL FORMING TECHNOLOGY ASSESSED
B. Sickel *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 12-15 refs Transl. into ENGLISH from Fertigunstech. und Betr., (East Berlin), v. 34, no. 10, 1984 p 590-591 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

Technological developments in the German Democratic Republic in the area of metal forming are described. Work done by the Erfurt VEB Herbert Warnke Forming Technology Combine in machine tool production is highlighted. B.W.

N85-20169# Joint Publications Research Service, Arlington, Va.
NEW PCB PRODUCTION FOR ROBOTICS APPLICATION c37
Juergen W. Boehme *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 16-17 Transl. into ENGLISH from Freiheit (Halle, East Germany), 9 Nov. 1984 p 10 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

The in-house production of rationalization devices in the Center for the Manufacture of Circuit Boards in the Mansfeld combine is described. The center also comes within the province of the Ministry of Mining, Metallurgy and Potash. The circuit boards manufactured here are required especially for industrial robot controls, microcomputer controls and additional automation projects aimed at Mining and Foundry operations. B.W.

N85-20170# Joint Publications Research Service, Arlington, Va.
INCREASED USE OF CNC IN MACHINE TOOL CONSTRUCTION c37
R. Waetzig *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 18-22 Transl. into ENGISH from Fertingungstech. und Betr. (East Berlin), v. 34, no. 11, 1984 p 646-647, 676 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

The increased use of computerized numerical control in machine tool construction is examined. Gains in efficiency achieved through the use of microelectronics and robot technology are discussed. B.W.

N85-20171# Joint Publications Research Service, Arlington, Va.
RELIABILITY OF DNC SYSTEM EXAMINED c38
J. Schaller *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 23-32 refs Transl. into ENGLISH from Fertigunstech. und Betr. (East Berlin), v. 34, no. 11, 1984 p 648-651 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

Since the middle of the sixties there has been taking place a process of integration between information technology and numerical control technology and this is leading to various levels of quality in control, such as CNC--computerized numerical control, DNC--direct numerical control. The development of CNC even in its early stages began with sharply differentiated engineering solutions. The early experts treated DNC and CNC as alternative strategies. Necessarily, direct numerical control had nothing equivalent to compare with the impressive advantages of the stored program NC. A DNC system was put into operation by stages at the VEB Heavy Machinery Combine in Takraf. The reliability and operating requirements of the DNC system are explained. B.W.

N85-20172# Joint Publications Research Service, Arlington, Va.
NEW CNC SYSTEMS DESCRIBED c37
W. Herbst *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 33-38 Transl. into ENGLISH from Fertigungstech. und Betr. (East Berlin), v. 34, no. 11, 1984 p 652-658 (For primary document see N85-20165 11-31)
Avail: NTIS HC A02/MF A01

The trend toward the automation of machine tools, the development of CNC-controlled machine tools and the introduction of industrial robot technology and manipulatory technology are leading to ever higher demands upon the controls for these machines and this equipment. Because of deficient knowledge hitherto of grinding technology on the part of the manufacturers of control systems and because of the specific nature of grinding technology there was little specialized equipment available on the market in the domain of control technology for this particular branch of industry. For this reason, a microelectronic control system, which is freely programmable and designed optimally for grinding machines was developed. B.W.

N85-20173# Joint Publications Research Service, Arlington, Va.
TELEMETRY SYSTEMS OF INTERKOSMOS SATELLITES c17
Tamas Hetenyi *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 43-44 Transl. into ENGLISH from Magyar Elektron. (Budapest), no. 1, 1984 p 95 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

The INTERKOZMOS space research organization of the socialist countries has been conducting regular scientific research of the region about the Earth since the middle 1960's. Efforts to standardize the telemetry of INTERKOSMOS satellites are reported. B.W.

N85-20174# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
19 Feb. 1985 141 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-WST-85-008) Avail: NTIS HC A07/MF A01

News items, abstracts, and scientific reports on aspects of science and technology including advanced materials, aerospace engineering, civil aviation, computers, factory automation, microelectronics, and scientific and industrial policy. For individual titles, see N85-20175 through N85-20182.

N85-20175# Joint Publications Research Service, Arlington, Va.
SIEMENS-CORNING PLANT TO MANUFACTURE OPTICAL FIBERS c74
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 1-2 Transl. into ENGLISH from Handelsblatt (Dusseldorf), 4 Dec. 1984 p 12 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

This production site for lightwave conductors (glass fiber) is

almost as large in its first expansion stage as the joint glass fiber plant in Berlin. Production is scheduled to start as early as 1986. Construction of a new light wave conductor plant in Nevstadt also insures that a drop in production of copper communications cable in the neighboring cable and conduit factory can be profitably achieved through the use of light wave conductors, based on market requirements. B.G.

N85-20176# Joint Publications Research Service, Arlington, Va.
FRG'S DFVLR READY FOR PARTICIPATION IN SPACE STATION **c18**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 3 Transl. into ENGLISH from Frankfurter Allgem. Zeitung (Frankfurt/Main), 3 Dec. 1984 p 10 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

Participation by West Germany in the space station with its anticipated share of eight billion dollars is discussed. The Transonic European Wind Tunnel and propfan technology are also examined. B.G.

N85-20177# Joint Publications Research Service, Arlington, Va.
MBB USES SUPERPLASTIC FORMING, DIFFUSION BONDING FOR ALLOYS
In its West Europe Rept. Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 5-6 Transl. into ENGLISH from Franfurter Zeitung/Blick Durch die Wirtsch. (Frankfurt/Main), 3 Dec. 1984 p 7 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

The need for the greatest economy possible when operating airplanes requires, among other things, a low structural weight and low manufacturing costs. Superplastic forming and diffusion bonding are considered to be an extremely effective technology or lowering production costs drastically. Both procedures are discussed. B.G.

N85-20178# Joint Publications Research Service, Arlington, Va.
SIEMENS INTRODUCES FAST COMPUTER WITH PIPELINE ARCHITECTURE **c60**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 8 Transl. into ENGLISH from Die Computer Zeitung (West Germany), 3 Oct. 1984 p 1 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

The Siemens VP100/VP200 vector processor system (VPsystem) was designed to solve especially high volume numerical problems in commercial, scientific, and technical applications. For fast and economic processing, such tasks are processed in vector form and executed moreover in parallel. B.G.

N85-20179# Joint Publications Research Service, Arlington, Va.
OVERVIEW OF LEADING-EDGE RESEARCH AT FRENCH CNRS LAB **c37**
P. Truc *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 9-25 refs Transl. into ENGLISH from Micro et Robots (Paris), Jan. 1985 p 42-50 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

The leading-edge research carried out at the LIMSI (Mechanical and Engineering Sciences Data Processing Laboratory) includes robotics, voice recognition and synthesis, computer-aided design, and mechanics. B.G.

N85-20180# Joint Publications Research Service, Arlington, Va.
FRENCH PANEL MAKES SPECIFIC PROPOSALS FOR ROBOTICS RESEARCH. CURRENT STATE OF FRENCH ROBOTICS **c37**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 27-99 Transl. into ENGLISH from the book "Mission Robotique 1" Paris, 1984 p 27-29 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

Although because of the novelty of the products and the disparity of needs, it is difficult today to delimit the robotics sector and to precisely estimate the magnitude of its markets, the panel has found it useful to support its conclusions and guidelines with an analysis of current conditions. Four areas of consideration are adequate research level; recent market expansion; delicate and technologically dependent supply; lack of coordination and overall policy. B.G.

N85-20181# Joint Publications Research Service, Arlington, Va.
STATUS OF SPECIFIC FRG HIGH TECH RESEARCH FUNDED BY BMFT **c81**
Joerg Kieser and Michael Sellschopp *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 117-125 Transl. into ENGLISH from VDI Nachr. (Dusseldorf), 12 Oct. 1984 p 28 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

Crosslinked polymers; laser components; surface treatment; information technology; microperiphals; electronically-controlled engines; manipulators; and voltage regulators are discussed. B.G.

N85-20182# Joint Publications Research Service, Arlington, Va.
FRENCH RESEARCH MINISTER ON POLICY, TECHNOLOGY TRANSFER **c85**
Ph. Grange and J.-C. Hanus *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 128-135 Transl. into ENGLISH from Micro et Robots (Paris), Nov. 1984 p 42-45 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

Technology transfer; relationship of science and politics; robotics; industry responsibility; research laboratories; and regionalization are discussed. B.G.

N85-20183# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
11 Feb. 1985 80 p ref Transl. into ENGLISH from various West European articles
(JPRS-WST-85-006) Avail: NTIS HC A05/MF A01

This West Europe report presents research developments in science and technology. Topics covered include: (1) advanced materials research in silicon carbide fiber manufacturing; (2) automotive engines; (3) civil aviation; (4) microcomputers; and (5) microelectronics. For individual titles, see N85-20184 through N85-20188.

N85-20184# Joint Publications Research Service, Arlington, Va.
SEP OF FRANCE MANUFACTURES ITS FIRST SILICON CARBIDE FIBERS **c24**
Alain Perez *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 1-2 Transl. into ENGLISH from Ind. and Tech. (Paris), 1 Oct. 1984 p 25 (For primary document see N85-20183 11-31)
Avail: NTIS HC A05/MF A01

The successful utilization of silicon carbide fibers in thermomechanics is reported. The manufacturing process is described along with industrial applications. B.W.

N85-20185# Joint Publications Research Service, Arlington, Va.
FIAT INTRODUCES 1000-CC ENGINE **c37**
In is West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 7-19 Transl. into ENGLISH from ATA-Ing. Automotoristica (Turin), Oct. 1984 p 551-558 (For primary document see N85-20183 11-31)
Avail: NTIS HC A05/MF A01

The design of the Fiat automotive engine in the + or - 1000-CC cylinder capacity range is described. Advantages such as weight, fuel consumption and high performance are discussed. B.W.

N85-20186# Joint Publications Research Service, Arlington, Va.
AIRBUS FATIGUE TESTS Abstract Only **c05**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 37 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 22 Nov. 1984 p 15 (For primary document see N85-20183 11-31)

Avail: NTIS HC A05/MF A01

The Airbus A 310 has successfully undergone many fatigue, aging and fracture tests. Thus, at the Toulouse Aeronautical Testing Center (CEAT), the aircraft structure withstood a load equal to 1.67 times the load the aircraft might have to bear under the worst possible operating conditions. On the verge of breaking, its wings then assumed an impressive curvature. According to Airbus Industrie, this result shows the high quality level of the engineering departments which designed the A 310. An aircraft is not expected to have a safety factor in excess of 1.5. At the same time, an Airbus A 310 structure withstood 90,000 fatigue cycles (one cycle simulates a complete flight, including takeoff, flying proper and landing). The aircraft, which has a expected life time of 20 years, should not have to go through more than 40, 000 cycles. Author

N85-20187# Joint Publications Research Service, Arlington, Va.
ESOP EXPERT SYSTEM MODEL DESCRIBED **c61**
Pierre Jouvelot and Daniel LeConte desFloris *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 38-44 ref Transl. into ENGLISH from Minis et Micros (Paris), 8 Oct. 1984 p 91-94 (For primary document see N85-20183 11-31)
Avail: NTIS HC A055/MF A01

A mockup called Esop (Expert System Open Propositional) implanted in Pascal language on a microcomputer is described in detail. The validity of the concept of metarules within the framework of the logic of the propositions was tested. B.W.

N85-20188# Joint Publications Research Service, Arlington, Va.
CAD/CAM SYSTEMS FOR PRINTED CIRCUIT DESIGN, MANUFACTURE **c61**
Catherine Gross *In* is West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 51-54 Transl. into ENGLISH from Electron. Ind. (Paris), 15 Oct. 1984 p 43-45 (For primary document see N85-20183 11-31)
Avail: NTIS HC A05/MF A01

In the very near future, all phases from the design to the fabrication of printed circuits, from the laboratory to the design department, will be automated, by means of end-to-end CAD/CAM (Computer-Aided-Design/Computer-Aided-Manufacturing) systems. These systems of the future will enable the rational transfer of data between software packages and work stations, from simulation to placement and routing, from physical layout to photo-plotter controls and automatic test benches. B.W.

N85-20189# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
18 Sep. 1984 36 p Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-026) Avail: NTIS HC A03/MF A01

Applications of remote sensing in China, advances in computational fluid dynamics and research in radiation protection are discussed. Heat transfer in hypersonic flow is also examined. For individual titles, see N85-20190 through N85-20196.

N85-20190# Joint Publications Research Service, Arlington, Va.
REMOTE SENSING TECHNOLOGY NOW PLAYING PRACTICAL ROLES **c43**
In its China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 1-6 Transl. into ENGLISH from Dianzi Shijie (Peking), no. 5, 1983 p 4-5 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

China has launched and recovered numerous scientific research satellites and has successfully developed many types of aerial remote sensors, including the highly sophisticated multiband scanner and synthetic aperture lateral view radar. Rather high levels of development in designing and test producing optical image processors have been attained and the prospects of digital image processors being incorporated and assimilated in this area are promising. Many provinces, municipalities, and regions have been successful in experimenting with aerial remote sensing and satellite imagery analysis. Applications of remote sensing agriculture, evaluating mines and natural resources, and environmental monitoring are reviewed. A.R.H.

N85-20191# Joint Publications Research Service, Arlington, Va.
A FAST ALGORITHM OF THE FINITE DIFFERENCE METHOD FOR COMPUTATION OF THE TRANSONIC FLOW PAST AN ARBITRARY AIRFOIL WITH THE CONSERVATIVE FULL-POTENTIAL EQUATION Abstract Only **c02**
Mingke Huang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 22 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 19-24 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

Based on the methods developed by Jameson and Holst, a computer program was developed for computating the transonic flow past an arbitrary airfoil, by the finite difference method. A conformal mapping is applied to map the exterior of the airfoil onto the interior of a circle. By a radical transformation reducing the effects of the singularity at the center of the circle, the use of the perturbation velocity potential is avoided. The governing equation, simpler than those used by Jameson and Holst, is approximated by a finite difference equation, which is then solved by AF2 iteration scheme in computing plane. The computations of the pressure distribution over the airfoil of NACA 0012 for subcritical and supercritical cases show the results are in excellent agreement with those by Holst's method. Author

N85-20192# Joint Publications Research Service, Arlington, Va.
A MIXED FINITE DIFFERENCE ANALYSIS OF THE INTERNAL AND EXTERNAL TRANSONIC FLOW FIELDS OF INLETS WITH CENTERBODY Abstract Only **c34**
Shijun Luo, Huili Shen, Minggang Ji, Zongwen Xing, Songye Dong, and Aiqing Han *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 23 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 25-34 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

A mixed finite difference method for calculating the external and internal flow field around inlet with centerbody is presented. First, calculation by mixed finite difference method of the velocity potential equation with small disturbance in the transverse direction using Cartesian mesh, irrotational schemes, and exact body surface boundary conditions is carried out to obtain a basic field solution including the shape and location of the shock and the sonic line. Then, the full potential equation is used to improve the accuracy of the computed value of field variables. The use of multi-layer line relaxations along the radial lines is effective for inlet with centerbody, and in this case, more relaxation sweeps are carried out (with smaller relaxation factor) inside the inlet than outside. Computations were made for axisymmetric inlet with different freestream Mach numbers M (infinity) = 1.04 to approximately 1.27. Computation results show that the method is promising. Author

N85-20193# Joint Publications Research Service, Arlington, Va.
FINITE DIFFERENCE METHOD FOR SOLVING TURBULENT BOUNDARY LAYER EQUATIONS Abstract Only **c34**
Meilin Pan and Zhanqing Liu *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 24 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 41-49 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

A method is presented for numerically solving laminar, transitional and turbulent compressible boundary layer equations for axisymmetric flows with a three-point implicit finite difference scheme. The turbulent boundary layer is treated with a two layer concept, and at each layer appropriate eddy viscosity models are used to represent Reynolds stress terms. In order to relate the turbulent heat flux term with the Reynolds stress, the turbulent Prandtl number is assumed to be a constant. The system of governing equations is solved with an iteration method. For several situations, satisfactory results are obtained using an improved eddy

viscosity model and a smooth method of the eddy viscosity distribution. Author

N85-20194# Joint Publications Research Service, Arlington, Va.
A STUDY FOR CALCULATING ROTOR LOADS USING FREE VORTEX CONCEPT Abstract Only c02
Tianen Ruan, Qingrui Han, Ruiguang Li, and Xinkang Shen *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 25 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 50-60 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

A rotor discrete free wake geometry and the blade airloads at each instant were obtained using a procedure of step-by-step iteration through a process similar to the start-up of a rotor in a free stream. It is not until the wake has steadied down that the calculating can come to a stop. After the steady vortex wake is obtained, the wake-induced downwash on each point interested and on the rotor can be computed. The theory of the thin airfoil and an appoximate formula for lift and drag coefficient (resulting for experimentation) suitable for the overall rangle of angle of attack that the blades would encounter when operating, are used to determine get the blades' airloads and their responses. There is good agreement between the first four harmonics airloads resulting from calculation and loads obtained from flight test. A.R.H.

N85-20195# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER TO BLUFF CYLINDERS AND CONES IN HYPERSONIC RAREFIED GAS FLOW Abstract Only c02
Wei Hua *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1985 p 26 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 61-65 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

The heat transfer to bluff cylinders and sharp 10-deg half-angle cone at an angle of attack of 0 deg. was investigated in the low-density, hypersonic wind tunnel. Stagnation point and surface heat transfer data are obtained over a range of test conditions: Mach numbers at 12 and 24, and unit Reynolds numbers from 1000 to 7000 per centimeter. The approximation formulae of the heat transfer are set up in rarefied transitional regimes. Previously published experimental results and calculations from these approximations formulae are compared. Author

N85-20196# Joint Publications Research Service, Arlington, Va.
ATMOSPHERIC DIFFUSION IN HILLY REGION ON MIDDLE REACHES OF THE CHANG JIANG Abstract Only c45
In its China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 29-31 Transl. into ENGLISH from Fushe Fang (Taiyuan, China), v. 4, no. 2, 10 Mar. 1984 p 81-89 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

Instruments were installed on a 102-meter high tower to measure wind speed, direction, and fluctuation; temperature profile; and humidity. Vertical diffusion parameters were obtained using smoke photography. The horizontal diffusion characteristics and the effect of release height on the horizontal diffusion parameter were also determined. The smoke column was conical under certain weather conditions, reflecting the effect of roughness in a hilly area where the turbulent vertical diffusion parameter is larger than that in a plain region. The horizontal diffusion parameter decrease with increasing release height under the same weather condition at the same location. The Lagrangian-Euler time scale ratio was 3.7 which is lower than that in a plain region. The mean annual diffusion factor deviated from the calculated based on the P-G curve due to the rough terrain. The Gaussian diffusion method must be modified by taking the terrain into consideration. Author

N85-20197# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
10 Sep. 1984 80 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-025) Avail: NTIS HC A05/MF A01

Articles addressing information pertinent to the applied sciences are presented. Also included were short exerpts from the life sciences, a list of activities from their electronics and computer science organizations, and abstracts from papers on armaments, nuclear engineering, and nuclear science. For individual titles, see N85-20198 through N85-20201.

N85-20198# Joint Publications Research Service, Arlington, Va.
RADIOGRAPHIC INSPECTION OF BUTT WELDS DESCRIBED c38
Junzhe Zhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 1-10 Transl. into ENGLISH from Wusun Jiance (China), no. 2, 1984 p 16-19 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

The double wall transillumination, double image technique of X-ray radiography was employed to inspect a butt welded section of a small spherical thick wall vessel (100 to 200 mm outer diameter, 6 to 10 mm wall thickness). Areas of importance that were considered were; (1) focal points; (2) X-ray angle of incidence; (3) radiation hardness (X-ray wavelength); (4) the use of an intensifying screen; (5) the selection of film type; and (6) the shielding of scattered X-rays. Through the selection of the correct values for these parameters, inspection sensitivity was increased to approximately 1.5%. G.L.C.

N85-20199# Joint Publications Research Service, Arlington, Va.
THERMOPHYSICAL PROPERTIES OF MATTER c25
In its China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 11-12 Transl. into ENGLISH from Ziran Zazhi (China), no. 1, 1984 p 28-29 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

Scientific research resources in China were organized and measurement methods and facilities for thermal conductivity and specific heat were established for different temperature ranges. The first high temperature annual symposium was held in 1961 and made a good start for China's thermophysical properties study. In the past 20 years China has made considerable progress in thermophysical research and has formed a science and technology rank of substantial quantity and quality. One important goal was to satisfy the timely needs of thermophysical properties data and testing techniques in China's aviation, aerospace and nuclear technology development. On the whole, however, there is still a considerable gap between China's thermophysical research level and the international standard. Many weak links need to be strengthened and many voids need to be filled. G.L.C.

N85-20200# Joint Publications Research Service, Arlington, Va.
A 10/SUP 11/W HIGH CURRENT PULSE ELECTRON BEAM ACCELERATOR DESCRIBED c72
Chuanxin Lu, Baozeng Song, guannu Wu, Pizhang Zhou, Chunsheng Zhang, Judi Zhang, Changhe Zhao, Zhongsen Guo, Yongzai Man, and Jingping Lu *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 33-42 refs Transl. into ENGLISH from Hejubian Yu Dengliziti Wuli (China), v. 3, no. 4, 15 Dec. 1983 p 235-240 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

A 10 to the 11th power W water medium high current pulse electron beam accelerator was developed. The machine configuration, principal parameters and operating conditions are described. The experiments of the diode focus are presented in detail and the comparison of experimental results for different cathode geometrics is given. The pinched electron beam behavior is diagnosed by means of an X-ray pinhole camera, a graphite calorimeter and a scintillator optical fiber photomultiplier system. The experimental results are also given. Author

N85-20201# Joint Publications Research Service, Arlington, Va.
MICRO-DEFORMATION OF QUARTZ UNDER DYNAMIC ACTION AND ITS APPLICATIONS c35

Lin Zhu and Guangkui Meng *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 43-56 Transl. into ENGLISH from Diqiuhuaxue (China), no. 4, 1982 p 403-411 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

Under the action of large stress, rocks and minerals undergo a series of deformation. By studying the microdeformation of specimens in controlled impact experiments, one can determine the relationship between microdeformation and pressure and thereby estimate the shock wave pressure endured by rocks in a underground nuclear explosion and use the data as a basis for classifying the damage zones in a free field explosion medium. The plane wave shock method is a good technique for simulating underground nuclear explosion. The plane shock wave experiment in granite medium at China's underground nuclear test site was discussed. Also describe the observation of microdeformation of quartz under petrographic microscopes and preliminary applications of distinguishing the rock damage zones in the free field after a underground nuclear explosion. Author

N85-20202# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
22 Oct. 1984 47 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-032) Avail: NTIS HC A03/MF A01

News items, abstracts, and scientific reports on aspects of science and technology including national developments, applied sciences, life sciences, nuclear physics, and scientists and scientific organizations are described. For individual titles, see N85-20203 through N85-20205.

N85-20203# Joint Publications Research Service, Arlington, Va.
OPTICAL PROCESSOR FOR SYNTHETIC APERTURE RADAR c32
Song Jiajun, Yuan Huikun, Wang Wuping, and Yinfang Mao *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-032) 22 Oct. 1984 p 2-8 refs Transl. into ENGLISH from Dianzi Kexue Xuebao (Peking), no. 5, 1983 p 265-270 (For primary document see N85-20202 11-31)
Avail: NTIS HC A03/MF A01

A three-lens optical processor for the on-site processing of the data of a synthetic aperture radar is described. It is compact, flexible, easily adjustable, widely adaptable and easy to assemble and disassemble. Author

N85-20204# Joint Publications Research Service, Arlington, Va.
NEW AIR SUPPLY-PRIME MOVER FACILITY FOR ENGINE TESTS DETAILED c37
In its China Rept.: Sci. and Technol. (JPRS-CST-84-032) 22 Oct. 1984 p 9-15 Transl. into ENGLISH from Guoji Hankong (Peking), no. 7, Jul. 1984 p 30-32 (For primary document see N85-20202 11-31)
Avail: NTIS HC A03/MF A01

The development of new engines and the verification of technical specifications of engine parts require conducting experimental research conditions in order to determine their performance and mechanical reliability. Air supply and prime mover facilities are pre-requisites for performing tests on engines and engine parts. Air Supply facility provides the required air flow for the test equipment used in aerodynamic, combustion, blade screen, heat transfer and turbine tests; prime mover facility provides the drive power for testing compressors and transmission systems. The capability of the air supply and prime mover facility will determine the range of parameters and the scope of the tests. The facility imported is primarily used by universities and colleges for research and instruction; therefore, the main requirements of this facility are advanced technical design and versatility. In the following, the main features of the components and the overall system of this imported facility are introduced. Author

N85-20205# Joint Publications Research Service, Arlington, Va.
BIOMECHANICS FINDS PRACTICAL APPLICATIONS IN AEROSPACE RESEARCH
Xu Yanghe *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-032) 22 Oct. 1984 p 16-21 Transl. into ENGLISH from Hangkong Zhishi (Peking), no. 8, Aug. 1984 p 2-3 (For primary document see N85-20202 11-31)
Avail: NTIS HC A03/MF A01

Biomechanics is a branch of science which studies the mechanical properties of biological parts using the basic principles of mechanics and engineering. Formulas and quantitative calculations are used to analyze and understand physiological phenomena. Problems caused by weightlessness, coronary heart disease, blood circulation, use of medication, and application of biomechanics in aviation rescue are discussed. B.G.

N85-20206# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
3 Dec. 1984 156 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-039) Avail: NTIS HC A08/MF A01

The research and development in science and technology in China is reported. The Star Wars space program is reported in the Chinese press. A thermionic converter for a space reactor is described as is the development of a super large circuit. A routing algorithm for distributed computer network was developed and research in environment biology is reviewed. The radioactive dose on China's population is assessed and a report on China's first lung cancer research center is studied. Transonic and subsonic flow past an oscillating wing and an flexible wing is discussed under the heading aerodynamic along with other developments. For individual titles, see N85-20207 through N85-20218.

N85-20207# Joint Publications Research Service, Arlington, Va.
PRC JOURNAL DISCUSSES 'STAR WARS' SPACE PROGRAM c12
Qubing Zhuang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 1-8 Transl. into ENGLISH from Shijie Zhishi (China), no. 19, 1 Oct. 1984 p 7-9 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

The arms race in space between the United States and the USSR has become increasingly fierce, and both sides are setting up their own space strategic systems. The holding of bilateral talks on space weapons has not been successful. The shadow of a future space war is looming large, becoming one of the important problems attracting the attention of the international community. The competition for superiority in space started long ago, and is regarded as an entension and development of the arms race between the United States and the USSR. The USSR has made very great efforts in this regard and has gained some advantage in the field of anti-satellite weapons. The United States deems it necessary to gain the upper hand, but the USSR does not want to let it happen, and the endless contention continues. Attempts are made to describe and analyze the decision-making of the United States, the current difficulties, the reasons for mapping out policies, and the impact on the situation inside and outside the United States. Author

N85-20208# Joint Publications Research Service, Arlington, Va.
THERMIONIC CONVERTER FOR SPACE REACTOR DESCRIBED c73
Shengquan Cao and Jicai Yang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 60-69 refs Transl. into ENGLISH from He Kexue Yu Gongcheng (China), v. 4, no. 3, Sep. 1984 p 227-232 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

Thermionic converters have many advantages as space reactors. During the past several years six experiments, four in-pile and two out-pile were conducted. Tandem converters consisting of three sections were tested in three of the in-pile experiments, which revealed that the peak power density was W = 2.4 W/square centrimeters, the electrode efficiency was eta = 4.2%, and the emitter temperature was T sub E - 1460 C. A single section converter was tested in the fourth in-pile experiment and

it was found that W = 5.6 W/square centimeters, eta = 8%, T sub E = 1540 C. The two out-pile experiments indicated that for emitter temperature T sub E = 1600 C, the peak power density and electrode efficiency were equal to W = 7.8 W/square centimeters and eta = 12.7%, respectively. Author

N85-20209# Joint Publications Research Service, Arlington, Va.
HIGH QUALITY SUPER-LARGE CIRCUITS DEVELOPED Abstract Only **c33**
In its China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 70 Transl. into ENGLISH from Xinhua (China), 8 Nov. 1984 n.p. (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

Beijuing, 8 Nov (XINHUA), China has recently achieved a technological breakthrough in the research and development of 3-micron integrated circuits. The arrival of the high speed compensated metallic oxide semiconductor circuit (CMOS), which is made with this new technology, indicates that China has entered a new stage from making low grade large-scale integrated circuits to high grade super large integrated circuits. The high speed CMOS circuit has been extensively used in high speed numerical transmission, high speed calculators, educational instruments and meters, industrial automatic control, and household electric applicances. This kind of circuit is even more suitable for use in military electronic engineering. It not only retains the ordinary CMOS circuit's capability to consumer little power and resists strong interference, but it also eliminates the drawback of slow speed. Author

N85-20210# Joint Publications Research Service, Arlington, Va.
GUIDEPOST ROUTING ALGORITHM FOR DISTRIBUTED COMPUTER NETWORKS **c62**
Zhongxiu Sun, Du Zhang, and Peigen Yang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 71-77 refs Transl. into ENGLISH from Dianzi Xuebao (China), no. 1, Jan. 1984 p 35-39 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

A routing algorithm called GUIDEPOST which is not only simple and efficient, but also independent of network topology is presented. Implemented in the ZCZ distributed computer system, the algorithm has proven to be highly suitable for distributed microcomputer systems. This routing algorithm bears the following characteristics: (1) low system overhead cost; (2) minimum relay distance; (3) independent of network topology; and (4) fairly reliable. It is also suitable for local networks composed of interconnected microcomputers. Author

N85-20211# Joint Publications Research Service, Arlington, Va.
RESEARCH IN ENVIRONMENTAL BIOLOGY REVIEWED **c51**
Deming Wang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 78-92 Transl. into ENGLISH from Huanjing Kexue (China), no. 6, 30 Dec. 1983 p 61-67 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

Relevant institutes of the Chinese Academy of Sciences, colleges and universities, agricultural and forestry research units, environmental research units, etc., conducted much research and published many reports and summaries on pollution ecology, biological purification, biological degradation and the biological effects and biological monitoring of pollutants. Some specific areas of review are: (1) Research on the biological effects of pollutants, (2) progress in life Science Research, (3) useful indicator organisms applied to biological montioring and evaluation of water pollution, (4) the prevention of water pollution, (5) applied and mechanical studies of atmospheric pollution and plants, (6) farmland environmental protection, and (7) environmental conservation. E.R.

N85-20212# Joint Publications Research Service, Arlington, Va.
A LOCALLY LINEARIZED PANEL METHOD FOR TRAN-/SUBSONIC FLOW PAST AN OSCILLATING WING Abstract Only **c02**
Binggang Tong, Lixian Zhuang, and Xianlin Li *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 129 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 20-27 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

The down wash integral equation for the small perturbation transonic potential flow past an oscillating wing is established based on the local linearization concept. The method for calculating the tran-/subsonic kernel function is discussed in detail. To calculate the unsteady pressure or an oscillating rectangular wing in the tran-/subsonic flow, the generalized-doublet-lattice-method is used. The results show that the locally linearized panel method is more accurate than the usual linearized methods, but further work is needed to obtain a numerical method for calculating the tran-/supersonic flows. Author

N85-20213# Joint Publications Research Service, Arlington, Va.
TRANSONIC PRESSURE DISTRIBUTION COMPUTATIONS OF A FLEXIBLE WING Abstract Only **c02**
Keyang Shen and Xihua Zhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 130 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 28-33 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

An iteration method is used for computing the transonic pressure distribution on a flexible wing. The aerodynamic force is solved with the second order approximation method for transonic small disturbance potential flow. The structural deflection is computed using the one dimensional simple beam theory or a two dimensional flexibility matrix method. The typical computations for the M6 flexible wing indicate that the iteration number for flexible wing computation is only slightly more than that for a rigid one, and that the influences of the structural deflection on the airload and shock strength are important. Author

N85-20214# Joint Publications Research Service, Arlington, Va.
ON RELAXATION OF TRANSONIC FLOWS AROUND ZERO-LIFT AIRFOILS AND CONVERGENCE OF SELF-CORRECTING WING TUNNELS Abstract Only **c02**
Xueding Liu and Shijun Luo *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 131 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 34-41 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

The steady transonic potential flow around a symmetric airfoil at a zero angle of attack is computed by the mixed difference method with the assumption of small transverse velocity components. After some numerical experiments on the stability of various possible schemes of iteration in the relaxation, a tabie scheme is found and used to verify the convergence of two kinds of transonic self correcting wind tunnels which are based on the pressure distribution along (1) two control surfaces and (2) one control surface and the airfoil. Author

N85-20215# Joint Publications Research Service, Arlington, Va.
ON DETACHED SHOCK WAVE OF SPHERE MOVING WITH TRANSONIC VELOCITIES Abstract Only **c02**
Zhichu Zheng *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 133 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 98-103 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

There has been an increased interest in the shock shapes about blunt bodies at free stream approximately Mach 1. The experimental data obtained by testing the sphere in a ballistic range facility was analyzed and a single expression for the shock wave profiles of the sphere is presented. The polar form of this equation is r/R = (1 + sigma/R)(1 + epsilon/1 + epsilon cost theta), where the dimensionless value of shock detachment distance sigma/R and variation epsilon are functions of the uniform stream Mach number M sub infinity. In the 1 < Mach number < 4 range, especially at free stream approximately Mach 1, dimensionless quantities sigam/R, theta < and r/R, calculated by an equation given, show excellent agreement with free flying data. Also, this

equation can be extended to calculate the shock wave profiles of hemisphere cylinder and sperically blunted cones (half angle alpha < 8 deg). In addition, results in this paper can be extended for the study of the wall disturbance and test section flow field in a transonic wind tunnel. Author

N85-20216# Joint Publications Research Service, Arlington, Va.
FINITE DIFFERENCE COMPUTATION OF THE FLOW AROUND AIRFOILS IN TWO-DIMENSIONAL TRANSONIC SLOTTED WALL WIND TUNNEL Abstract Only **c02**
Naiping Zhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 134 Transl. into ENGLISH from Kongqidonglixue Xuebao (China), no. 3, 1984 p 104-109 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

The transonic flow around NACA 0012 and RAE 104 airfoils in a slotted wall transonic wind tunnel is calculated with the finite difference method. A two dimensional small disturbance velocity potential equation is adopted in this computation. The transonic airfoil wind tunnels at the Institute of Aerodynamics and Gasdynamics of Stuttgart University and at the Institute of Aerodynamics of Northwestern Polytechnical University in Xian were chosen as two computational examples. Only the solid blockage interference at zero angle of attack is calculated in this paper. The pressure distributions of the airfoil surface and the slotted wall along the streamwise direction, the additional lift coefficient due to the nonsymmetrical set up of the model in the test section are computed. The calculated results of the NACA 0012 and RAE 104 airfoils are compared with the experimental results of the Langley Research Center and those of the National Physical Laboratory in England respectively. The pressure distributions of the airfoil surface were simulated to equal those of the experiments for the selected Mach numbers. Author

N85-20217# Joint Publications Research Service, Arlington, Va.
A FREE ELECTRON LASER WITH TWO-COMPONENT WIGGLER Abstract Only **c36**
Shizhan Lei *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 145 Transl. into ENGLISH from Hongwai Yanjiu (China), v. 3, no. 3, 1984 p 184-188 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

A two component wiggler used for a free electron laser is discussed. The wiggler consists of a spatially periodic magnetic field which is in the former section and a spatially homogeneous one. It has the advantages of not only simplicity in construction and case in size expansion like a spatially homogeneous field wiggler, but also a very high gain and a very high efficiency of lasers due to the enhancement of the lateral velocity of electrons. Author

N85-20218# Joint Publications Research Service, Arlington, Va.
DESIGN AND ANALYSIS OF AIRBORNE SCANNING OPTICAL SYSTEMS Abstract Only **c74**
Tieming Wang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 146 Transl. into ENGLISH from Hongwai Yanjiu (China), v. 3, no. 3, 1984 p 199-208 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

Some scanning optical systems used in airborne scanners are described. The scanning method, scanning principles, ranges of scanning angles and positions of standard radiation sources are discussed. An analysis of characteristics of these scanners is given. Author

N85-20219# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
6 Dec. 1984 143 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-040) Avail: NTIS HC A07/MF A01

Progress in science and technology in the peoples republic of China is reported. Topics discussed include: applied sciences, life sciences, environmental quality, chemistry, and geology. For individual titles, see N85-20220 through N85-20221.

N85-20220# Joint Publications Research Service, Arlington, Va.
AIRBORNE REMOTE SENSING CCD IMAGING SYSTEM **c43**
Ma Zongquan *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-040) 6 Dec. 1984 p 65-72 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 1, 1984 p 96-99 (For primary document see N85-20219 11-31)
Avail: NTIS HC A07/MF A01

An airborne remote sensing charge coupled device (CCD) imaging and transmission system is presented. Imaging formulas were derived. The equation express the signal to quantiz noise ratio with delta modulation is given. Experimental results are presented. The system described includes: a linear array CCD camera, digital video transmitter, receiver, terminal display, and recording device. The airborne portion is comprised of a camera, antenna and digital transmitter. The total weight is less than 5 kilograms and the power consumption is less than 12 W. E.A.K.

N85-20221# Joint Publications Research Service, Arlington, Va.
METHOD FOR INCREASING LINEARITY OF LOAD CELL **c33**
Wu Xianyi *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-040) 6 Dec. 1984 p 73-78 Transl. into ENGLISH from Yiqi Yibiao Xuebao (Beijing), no. 1, 1984 p 103-106 (For primary document see N85-20219 11-31)
Avail: NTIS HC A07/MF A01

The output characteristics of a strain load cell often show a certain degree of nonlinearity due to factors such as the elastomer, the foil gage and the bonding agent. The use of a semiconductor foil gage to compensate for linearity is an effective method. The compensation principle is as follows: The semiconductor piece was adhered to the elastomer axially and connected to the bridge circuit. When the elastomer is shortened by pressure, the resistance r of the semiconductor is also reduced. Because r and the input resistance of the bridge circuit R sub AC form a serial bleeder circuit, if E is a constant voltage source, then the actual bridge voltage U sub AC also increases with increasing load. However, the output voltage delta E is proportional to U sub AC. Therefore, the slope of the output characteristic curve gets larger as the load increases; creating a nonlinear effect. If the nonlinearity of the measured value, prior to compensation is equal in absolute value and opposite in direction as this effect, then the linearity is compensated. In order to adjust the magnitude of compensation, in addition to varying the no load resistance of the semiconductor r sub and its sensitivity coefficient K sub r, a coil resistor r sub p was placed parallel to r. when on appropriate r sub p value is chosen based on the actual condition, linearity compensation can be optimized. E.A.K.

N85-20067# Joint Publications Research Service, Arlington, Va.
EXPLOSION-PROOF PROPERTIES AND HYDRAULIC RESISTANCE OF FIRE-BARRIER ELEMENTS BASED ON KNITTED METALLIC SCREENS Abstract Only
A. I. Elnatanov, I. I. Strizhevskiy, A. Ye. Rutkovskiy, N. S. Geyntse, V. A. Zorin, N. V. Andreyeva, A. A. Ivanchuk, and D. M. Karpinos *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 26-27 Transl. into ENGLISH from Poroshkovaya Met. (Kiev), no. 2, Feb. 1984 p 101-104 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-20222 British Library Lending Div., Boston Spa (England).
ELECTROMAGNETIC COMPATIBILITY OF MEASUREMENT

AND CONTROL EQUIPMENT IN NUCLEAR INSTALLATIONS
24 Sep. 1984 35 p Transl. into ENGLISH of unknown document
(BLL-WH-607-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Test procedures for the evaluation and measurement of the immunity of equipment exposed to electromagnetic interference in nuclear installations are described. B.G.

N85-20223*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF INTERFACIAL CHARACTERISTICS OF METAL CLAD POLYMERIC SUBSTRATES ON ELECTRICAL HIGH FREQUENCY INTERCONNECTION PERFORMANCE
K. B. Bhasin, R. R. Romanofsky, G. E. Ponchak, and D. C. Liu 29 Nov. 1984 10 p refs Presented at the Fall Meeting of the Mater. Res. Soc., Boston, 27-29 Nov. 1984
(NASA-TM-86948; E-2469; NAS 1.15:86948) Avail: NTIS HC A02/MF A01 CSCL 20N

Etched metallic conductor lines on metal clad polymeric substrates are used for electronic component interconnections. Significant signal losses are observed for microstrip conductor lines used for interconnecting high frequency devices. At these frequencies, the electronic signal travels closer to the metal-polymer interface due to the skin effect. Copper-teflon interfaces were characterized by scanning electron microscopy (SEM) and Auger electron spectroscopy (AES) to determine the interfacial properties. Data relating roughness of the copper film to signal losses was compared to theory. Films used to enhance adhesion are found, to contribute to these losses. E.A.K.

N85-20224*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN EXPERIMENTAL INVESTIGATION OF MICROSTRIP PROPERTIES ON SOFT SUBSTRATES FROM 2 TO 40 GHz
R. R. Romanofsky, K. B. Bhasin, G. E. Ponchak, A. N. Downey, and D. J. Connolly 1985 10 p refs To be presented at the Intern. Microwave Symp., St. Louis, 4-6 Jun. 1985; sponsored by the IEEE
(NASA-TM-86961; E-2489; NAS 1.15:86961) Avail: NTIS HC A02/MF A01 CSCL 17B

Dispersion and loss characteristics of microstrip lines on 10 mil and 31 mil electrodeposited and electroless copper clad-Teflon substrates were experimentally obtained from 2 to 40 GHz. The roles of surface roughness and radiation in total loss were examined. Author

N85-20225# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EMERGENCY LOCATOR TRANSMITTER (ELT) BATTERIES GUIDANCE AND RECOMMENDATIONS
Radio Technical Commission for Aeronautics Nov. 1984 30 p
(NASA-TM-87436; NAS 1.15:87436; RTCA/DO-188) Avail: NTIS HC A03/MF A01 CSCL 20N

The types of batteries practical for use in emergency locator transmitters; the advantage and adverse consequences of plotting cells in a battery pack; placement of batteries in cold storage to extend shelf life; and replacement batteries are examined. B.G.

N85-20226*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPROVED LEGISLATED EMERGENCY LOCATING TRANSMITTERS AND EMERGENCY POSITION INDICATING RADIO BEACONS Patent Application
William R. Wade, inventor (to NASA) (Proteon Associates, Inc.) Filed 28 Sep. 1984 23 p Sponsored by NASA
(NASA-Case-GSC-12892-1; NAS 1.71:GSC-12892-1; US-Patent-Appl-SN-655606) Avail: NTIS HC A02/MF A01 CSCL 17B

An emergency locating transmitting (ELT) system is disclosed which comprises a legislated ELT modified with an interface unit and connected by a multiwire cable to a remote control monitor (RCM), typically located at the pilot position. The RMC can remotely test the ELT by disabling the legislated swept tone and allowing transmission of a single tone, turn the ELT on for legislated ELT transmission, and reset the ELT to an armed condition. The RCM also provides visual and audio indications of transmitter operating condition as well as ELT battery condition. Removing the RCM or shorting or opening the interface input connections are not to affect traditional ELT operation. NASA

N85-20227# Dikewood Corp., Albuquerque, N. Mex.
SHIELDED ENCLOSURES FOR EXPERIMENTAL STUDIES OF SHIELDING TOPOLOGY Final Report, Jun. 1982 - Nov. 1983
F. C. Yang, K. S. H. Lee, S. A. Kokorowski, C. E. Baum, J. Hamm, W. Graf, and E. F. Vance Kirtland AFB, N. Mex. AFWL Nov. 1984 98 p
(Contract F29601-82-C-0027)
(AD-A149292; DC-FR-1026.610-1B; AFWL-TR-84-11) Avail: NTIS HC A05/MF A01 CSCL 20/14

The report discusses the effort to provide shielded enclosures for EMP experimental studies of shielding topology. Section 1 discusses the theoretical modeling for which scattering matrices of subshields and their norms are used to relate the internal signals to the electromagnetic source environment. Both the line and aperture penetrations are included in the scattering matrix formulation. Experimental and analytical methods are proposed for estimating parameters of the scattering matrices. It is pointed out in the discussion that these methods can, in turn, be employed to analyze the overall shielding performance and to synthesize the subshield requirements of a system. The discussion in Section 1 includes an illustrative example. Section 2 describes experiments to characterize and quantify the shielding performance of a rectangular metal enclosure containing various line and aperture penetrations. Experimental techniques and procedures are given for obtaining certain parameters involved in the theoretical model for bounding the shielding performance of an enclosure. Techniques for evaluation of the accuracy of the theoretical calculation and its comparison to measured data are also discussed. Section 3 describes specifications that were developed to construct two shielded enclosures, one with a single layer topology and one with a double layer topology. Details are given on the mechanical design of the two enclosures, and on the design of various replaceable panels that can be used to test the accuracy of the theoretical model. Section 4 describes the experimental results of the shielding performance of the two enclosures constructed by SRI International. GRA

N85-20228# Stanford Univ., Calif. Information Systems Lab.
RESEARCH ON ADAPTIVE ANTENNA TECHNIQUES 6 Final Report
Y. L. Su and B. Widrow Sep. 1984 143 p
(Contract N00019-83-C-0287)
(AD-A149341) Avail: NTIS HC A07/MF A01 CSCL 17/4

Signal cancellation is an effect which occurs in conventional adaptive arrays. This effect manifests itself as a loss of information in the desired signal. This presents two new adaptive array techniques to combat signal cancellation. These two techniques are known as the frequency-hop spread spectrum approach and the parallel spatial processing approach. The frequency-hop spread spectrum technique makes use of frequency-discrimination to combat jammer interference. Using the desired signal's frequency-hop nature, we can remove the signal from the adaptation process in a manner that eliminates signal cancellation. When the spread-spectrum technique and the spatial-discrimination inherent in adaptive arrays are combined, a system results with an interference rejection capability greater than either of the two alone. Several effective schemes and simulations are presented. The second technique makes use of spatial smoothing and parallel structure to eliminate signal cancellation. We show that this new scheme results in a maximum-likelihood estimate of the desired signal in a spatial averaging sense. Simulation results are presented to illustrate the effectiveness of this proposed technique for combating signal cancellation. GRA

N85-20229# California Univ., Livermore. Lawrence Livermore Lab.
PHENOMENOLOGY OF MICROWAVE COUPLING, PART 1
Ray J. King, James K. Breakall, H. Gerry Hudson, James J. Morrison, Vince G. McGevna, Karl S. Kunz, A. Peter Ludwigsen, and Daniel K. Gnade Nov. 1984 91 p refs
(Contract W-7405-eng-48)
(DE85-003097; UCID-20215) Avail: NTIS HC A05/MF A01

Advances in the development of high power microwave sources have increased the potential for future deployment of microwave weapons. A key ingredient in being able to predict the vulnerability of military systems to such threats involves understanding the phenomenology of how electromagnetic energy couples into cavity like objects, or the so called back door coupling. A similar but much longer standing problem is that of nuclear electromagnetic pulses (EMP) in which the frequencies extend up to several hundreds of MHz. However, compared to EMP coupling, microwave coupling is distinctively different because the wavelength is comparable to the size of the ports of entry. Coupling paths can be highly resonant at certain microwave frequencies, making the shielding against microwave threats difficult. The initial efforts at Lawrence Livermore National Laboratory to study the phenomenology of back door coupling at the low microwave frequencies (up to 2.5 GHz) are summarized. R.S.F.

N85-20230# Legislative Science Office, Lansing, Mich.
EFFECTS OF ELECTROMAGNETIC FIELDS PRODUCED BY HIGH VOLTAGE TRANSMISSION LINES Final Report
T. Young Jun. 1984 73 p refs
(DE85-900034; NP-5900034) Avail: NTIS HC A04/MF A01

The potential impacts of higher transmission line voltages on people, animals, and plants were determined. The differences among various studies are reviewed. Although there are some obvious dangers posed by transmission line operation, construction, and maintenance, most of these concerns are addressed by safety measures taken by utility companies. The indirect effects of power transission is reported. Three major categories of field effects are covered: (1) corona effects due to the electric field at the conductor's surface; (2) indirect coupling effects, arising from induced currents in nearby conducting objects; and (3) direct coupling effects, caused by induced currents in organisms. DOE

N85-20231# Tennessee Univ., Knoxville.
MULTIPLE PARALLEL WIRES ABOVE A FINITELY CONDUCTING PLANE EARTH IN THE PRESENCE OF A PLANE WAVE (EMP)
H. P. Neff, Jr. and D. A. Reed 9 Jul. 1984 49 p refs
(Contract DE-AC05-84OR-21400)
(DE85-001116; DOE/ER-21400/T49) Avail: NTIS HC A03/MF A01

The time-domain current induced in infinitely long, highly conducting, parallel wires above a finitely conducting plane earth in the presence of a plane electromagnetic wave is investigated. The plane wave is assumed to have its magnetic field perpendicular to the axis of the wires, and takes time-domain form of a double-exponential pulse. Results indicate that the currents are generally smaller than that induced in an isolated conductor because of the coupling between wires and the ground reflection. DOE

N85-20232# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
DESCRIPTION OF AMPLITUDE SCINTILLATIONS ON A 11 GHz SLANT PATH IN TERMS OF FORWARD SCATTERING FROM TURBULENT LAYERS
Friedrich Ruecker Aug. 1984 34 p refs In GERMAN; ENGLISH summary
(FI-455-TBr-76) Avail: NTIS HC A03/MF A01

In slant-path propagation experiments, amplitude scintillations were observed at 11 GHZ with OTS satellite on hot summer days when heavy cumulus clouds traversed the radio path. The scintillations are caused by refractive index fluctuations and can be described in terms of forward scattering by atmospheric turbulence. The scintillation process can be described by the power spectrum of the signal fluctuations. The distribution of the amplitude deviations is found to be Gaussian. From the variances measured concurrently with two antennas of different size, the altitude of the turbulent layer is derived. Author (ESA)

N85-20233# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
THE NOISE OF LASER DIODES WITH MODULATED INJECTION CURRENT
Bernhard Hein Aug. 1984 27 p refs In GERMAN; ENGLISH summary
(FI-465-TBr-23) Avail: NTIS HC A03/MF A01

The dependence of relative intensity noise in optical transmission systems on current modulation is investigated by means of a simulation program for the laser diode. The result shows that the real factor closely matches the factor determined for CW operation in cases of frequencies of up to some hundred megahertz. At 1 GHz and more there are considerable differences, depending on the modulation technique. Author (ESA)

N85-20234# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung HF-Verfahren.
QUANTIZATION STUDY FOR ERS-1 WAVE MODE
Aribert P. Wolframm and Timothy K. Pike Oct. 1984 311 p refs
(DFVLR-FB-84-39; ISSN-0171-1342) Avail: NTIS HC A14/MF A01; DFVLR, Cologne DM 94

The effects of wave spectra of 2 and 4 bit quantization schemes proposed for the analog to digital conversion of the synthetic aperture radar (SAR) video signal in the ERS-1 wave mode were simulated. The results indicate that spectra produced by the 4 bit conversion are not significantly degraded from the optimum, but that the 2 bit conversion requires precises gain control for correct spectral reproduction. The conclusions are supported by images and spectral plots covering the various options simulated. Author (ESA)

N85-20235# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
PROCESS ALGEBRA WITH ASYNCHRONOUS COMMUNICATION MECHANISMS
J. A. Bergstra, J. W. Klop, and J. V. Tucker Jun. 1984 27 p refs
(CWI-CS-R8410; B8475629) Avail: NTIS HC A03/MF A01

Algebraic specifications for a stimulus-response mechanism, for asynchronous non-order-preserving send and receive actions, and for asynchronous order-preserving send and receive statements are given. Author (ESA)

N85-20236# National Telecommunications and Information Administration, Annapolis, Md.
ASSESSMENT OF SATELLITE POWER FLUX-DENSITY LIMITS IN THE 2025-2300 MHz FREQUENCY RANGE, PART 2
A. Farrar Jul. 1984 98 p refs
(PB85-101244; NTIA/Rept-84/152-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 17B

The power flux-density (pfd) limits for satellite operating in the 2025-2300 MHz frequency range were calculated. Two computer models were modified in order to enhance their accuracy in the evaluation of the pfd limits in this and other bands. Distinctions were made between the satellites in geostationary satellite orbit and those in nongeostationary orbits and two different sets of limits were calculated; using the technical characteristics of equipment in the 2025-2300 MHz frequency range and the criteria of noise due to interference from satellites set by the CCIR Recommendation 357-3. The pfd limits calculated here for the 2025-2300 MHz frequency range are applicable in the portions of this frequency range authorized for use by space services. These limits were compared with the existing limits in the NTIA Manual and the analysis indicated that the pfd limits for satellites could be relaxed. GRA

N85-20237# National Bureau of Standards, Gaithersburg, Md.
COMPARISON OF MEASURED AND CALCULATED MUTUAL COUPLING IN THE NEAR FIELD BETWEEN MICROWAVE ANTENNAS Validation Summary Report
C. F. Stubenrauch and M. H. Francis Jun. 1984 57 p refs
(PB85-105963; NBSIR-84-3010) Avail: NTIS HC A04/MF A01 CSCL 09E

Measurements of near-field mutual coupling were performed between two moderate sized microwave antennas and compared to coupling calculated using recently developed computer programs. Input data for the programs are the complex far-field radiation patterns of the antennas. Experimentally determined and calculated coupling as a function of both transverse displacement and separation agree closely except for a constant offset observed in some cases. In addition, coupling values computed using a program which approximates the ar-field radiation patterns were compared to experiment and found to be satisfactory. GRA

N85-20238# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
DIGITAL CONTROLLER FOR THE WAVE PROPAGATION LABORATORY'S VHF AND UHF WIND-PROFILING RADARS
K. Moran Sep. 1984 115 p refs
(PB85-112142; NOAA-TM-ERL-WPL-119) Avail: NTIS HC A06/MF A01 CSCL 04B

Principles are described for operation of a digital system that is used to control the operations of a multiple beam stratospheric-tropospheric (ST) radar system. The digital system, referred to as the radar controller, contains the digital logic for generating the necessary pulse sequences for modulation of the radar transmitter, gating the radar's receiver channels, and sequencing the antenna beams. The radar controller also performs digital-to-analog conversion and coherent averaging of the receiver necessary for signal detection in ST radars. The radar controller is controlled internally by a Z80 microprocessor, and the entire system functions as a peripheral device to a host minicomputer. Block diagrams and detailed circuit schematics for all the custom designed electronics are included. GRA

N85-20239# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation lab.
SIGNAL PROCESSING AND RANGE SPREADING IN THE FM-CW RADAR
Edmond A. Costa and Russell B. Chadwick May 1984 48 p refs
(PB85-108256; NOAA-TR-ERL-425; WPL-58) Avail: NTIS HC A03/MF A01 CSCL 17I

One- and two-dimensional methods of processing data from the FM/CW radar, through use of discrete Fourier transforms, are shown to be subject to the undesirable effect of range spreading, in which power associated with a particular range cell is smeared into other range cells because of high sidelobes on the range spectrum, thereby interfering with velocity spectra associated with other range cells. Efforts to solve the problem are described; weighting the data produces promising results; results of ad hoc methods of smoothing are less promising. GRA

N85-20240# National Telecommunications and Information Administration, Washington, D.C.
POLARIZATION ANGLES OF LINEARLY POLARIZED ANTENNAS AND RADIO WAVES IN SATELLITE COMMUNICATIONS
H. Akima Oct. 1984 42 p refs
(PB85-131613; NTIA/Rept-84/163) Avail: NTIS HC A03/MF A01 CSCL 17B

It is necessary to calculate the polarization angles of antennas and radio waves for analyzing the mutual interference when a linearly polarized emission is used in satellite communications. A method for calculating the polarization angle has been developed. It is based on several coordinate systems appropriate for representing the polarization angle and on a series of coordinate transformations and of projections of vectors in coordinate planes. It is applicable to a variety of cases of practical importance. Comparisons are made with some existing methods applicable to special cases, and some numerical examples are given. A computer subroutine package that implements the developed method is also presented. Author (GRA)

N85-20241# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT OF THE AERONAUTICAL MOBILE SERVICE BETWEEN 400 MHz AND 17.7 GHz
F. Matos Sep. 1984 98 p refs
(PB85-125995; NTIA/Rept-84/162) Avail: NTIS HC A05/MF A01 CSCL 17B

A spectrum resource assessment of the aeronautical mobile service between 400 MHz and 17.7 GHz is presented which addresses the long-range planning of this service. An assessment is given of 15 federal government frequency bands that are allocated to the mobile or aeronautical mobile services. Information is included on allocations, technical standards, frequency assignments, and system characteristics. The future growth possibilities of the aeronautical mobile service in the various bands is presented. The 4400 to 4900 MHz band was analyzed in detail to determine the sharing possibilities between the fixed service (point-to-point microwave and troposcatter communications systems) and aeronautical systems. Evidence suggests that sharing between such systems and aeronautical systems is feasible. Author (GRA)

N85-20242# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT OF THE 7125-8500 MHz BAND
G. A. Crandall Sep. 1984 190 p refs
(PB85-127413; NTIA/Rept-84/159) Avail: NTIS HC A09/MF A01 CSCL 17B

A spectrum resource assessment of the 7125 to 8500 MHz band was conducted; included is information on frequency allocations, technical standards, spectrum usage, and identification of spectrum-management issues pertaining to this band. Recommendations are made to improve the current spectrum-management process to ensure efficient use of this band in the future. Recommendations include modifying certain technical standards, developing sharing criteria among several of the services using this band, and developing a frequency assigment model for fixed operations. Author (GRA)

N85-20243# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT OF THE FIXED AND MOBILE SERVICES IN THE 947-17,700 MHz BAND, PHASE 1
W. B. Grant and C. J. Chilton Sep. 1984 378 p refs
(PB85-128288; NTIA/Rept-84/161) Avail: NTIS HC A17/MF A01 CSCL 17B

A spectrum resource assessment of the bands containing fixed and mobile services in the 947 MHz to 17.7 GHz portion of the radio frequency spectrum was conducted; included is information on rules and regulations, allocations, technical standards, frequency assignments, and major system characteristics. The possibility of increased sharing between Government agencies and between Government and non-Government entities is considered for the various bands. Conclusions are drawn and recommendations made on sharing potential based on current usage data. Author (GRA)

N85-20203# Joint Publications Research Service, Arlington, Va.
OPTICAL PROCESSOR FOR SYNTHETIC APERTURE RADAR
Song Jiajun, Yuan Huikun, Wang Wuping, and Yinfang Mao *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-032) 22 Oct. 1984 p 2-8 refs Transl. into ENGLISH from Dianzi Kexue Xuebao (Peking), no. 5, 1983 p 265-270 (For primary document see N85-20202 11-31)
Avail: NTIS HC A03/MF A01

N85-20356*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUMMARY PRESENTATION OF THE ELECTRODYNAMICS INTERACTIONS PANEL
Nobie H. Stone *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 12 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 20N

N85-20363*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REPORT OF THE ELECTRODYNAMIC INTERACTIONS PANEL
Nobie H. Stone, Richard S. Taylor (Smithsonian Astrophysical Observatory), Susan Benford (NASA. Lewis Research Center), Joseph H. Binsack (MIT), Marino Dobrowolny (CNR, Italy), Patrick Finnegan (NASA. Lewis Research Center), Mario D. Grossi (Smithsonian Astrophysical Observatory), Marty Hudson (Martin Marietta, Denver), Devrie Intriligator (Carmel Research Center), Rim Kaminskas (TRW) et al *In its* Appl. of Tethers in Space, Vol. 2 Mar. 1985 19 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 20N

N85-20454*# Technische Univ., Graz (Austria). Space Research Inst.
SYNOPSIS OF MID-LATITUDE RADIO WAVE ABSORPTION IN EUROPE
K. M. Torkar and M. Friedrich *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 24-30 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 20N

N85-20457*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar Terrestrial Physics.
MEASUREMENTS OF PARTIAL REFLECTIONS AT 3.18 MHz USING THE CW RADAR TECHNIQUE
J. Priese and W. Singer *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 39-44 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 17I

N85-20463*# Bulgarian Academy of Science, Sofia. Geophysical Inst.
EXPLANATION OF THE NORMAL WINTER ANOMALY FROM THE SEASONAL VARIATION OF SHORT WAVE ABSORPTION
P. J. Velinov, N. V. Smirnova (Academy of Sciences (USSR), Murmansk), and V. A. Vlaskov (Academy of Sciences (USSR), Murmansk) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 70-74 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 20N

N85-20778# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
A MODERN APPROACH OF A SYNTHETIC APERTURE RADAR PROCESSOR AND ITS TECHNOLOGICAL ASPECTS
Horst Froehlich and Roland Schotter *In* AGARD Space System Applications to Tactical Operations Oct. 1984 7 p ref (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

N85-20809# Joint Publications Research Service, Arlington, Va.
NUMERICAL INVESTIGATION OF PROPAGATION OF RADIATION PULSE AT XXX Abstract Only
V. A. Levin, V. V. Netesov, and A. M. Starik *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 13 Transl. into ENGLISH from Zh. Prokladnoy Mekhaniki i Tekhnicheskoy Fiz. (USSR), no. 3, May-Jun. 1984 p 14-19 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-20244*# Hydraulic Research Textron, Irvine, Calif. Systems Engineering Div.
COMPENSATOR DEVELOPMENT AND EXAMINATION OF PERFORMANCE AND ROBUSTNESS
5 Oct. 1984 11 p Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-918; JPL-956541)
(NASA-CR-175470; JPL-9950-962; NAS 1.26:175470; Rept-956541-Extension-1) Avail: NTIS HC A02/MF A01 CSCL 09A

A compensator was synthesized to minimize the mean square surface error of a wrap rib antenna. Two separate cases were considered; one in which the flexible ribs and mesh were given weight, thereby penalizing the actual error of the reflecting area; and the other in which the antenna is considered rigid, thus penalizing only the rigid body rotation. The numerical results show that the flexible modes of the antenna have to be included in the performance criterion to obtain a better performance. G.L.C.

N85-20245*# National Aeronautics and Space Administration, Washington, D. C.
THERMAL INVESTIGATION OF AN ELECTRICAL HIGH-CURRENT ARC WITH POROUS GAS-COOLED ANODE
Ernst R. G. Eckert, Peter A. Schoeck, and Edgar R. F. Winter Dec. 1984 26 p refs Transl. into ENGLISH from Intern. J. of Heat Mass Transfer, v. 5, 1962 p 295-306 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original Doc. Prep. by Minnesota Univ.
(Contract NASw-4005)
(NASA-TM-77789; NAS 1.15:77789) Avail: NTIS HC A03/MF A01 CSCL 09A

The following guantities were measured on a high-intensity electric arc with tungsten cathode and transpiration-cooled graphite anode burning in argon: electric current and voltage, cooling gas flow rate (argon), surface temperature of the anode and of the anode holder, and temperature profile in three cross-sections of the arc are column. The last mentioned values were obtained from spectroscopic photographs. From the measured quantities, the following values were calculated: the heat flux into the anode surface, the heat loss of the anode by radiation and conduction, and the heat which was regeneratively transported by the cooling gas back into the arc space. Heat balances for the anode were also obtained. The anode losses (which are approximately 80% of the total arc power for free burning arcs) were reduced by transpiration cooling to 20%. The physical processes of the energy transfer from the arc to the anode are discussed qualitatively.
Author

N85-20246*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A NEW VERY HIGH VOLTAGE SEMICONDUCTOR SWITCH
Gale R. Sundberg 1985 17 p refs To be presented at the 16th Ann. Power Electron. Spec. Conf. (PESC), Toulouse, 24-28 Jun. 1985; sponsored by Inst. of Electrical and Electronics Engineers
(NASA-TM-86957; E-2480; NAS 1.15:86957) Avail: NTIS HC A02/MF A01 CSCL 09A

A new family of semiconductor switches using double injection techniques and compensated deep impurities is described. They have the potential to raise switching voltages a factor of 10 higher (up to 100 kV) than p-n junction devices while exhibiting extremely low (or zero) forward voltage. Several potential power switching applications are indicated. E.A.K.

N85-20247*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPARATOR WITH NOISE SUPPRESSION Patent Application
Colossie N. Batts, inventor (to NASA) Filed 18 Dec. 1984 9 p
(NASA-Case-LAR-13151-1; NAS 1.71:LAR-13151-1;
US-Patent-Appl-SN-683101) Avail: NTIS HC A02/MF A01 CSCL 09A

An apparatus for generating a single pulse the first time only that a noisy cyclic signal exceeds a reference level during a half-cycle is disclosed. For the positive half of a cycle of the noisy cyclic signa, a comparator 12 and a multivibrator 14 produce a fixed voltage output when the noisy cyclic signal first exceeds the reference level. A multivibrator 23 stops the production of the fixed voltage output when the noisy cyclic signal next passes the zero voltage level in the negative direction. Consequently, a single pulse is generated indicating that the signal exceeded the reference level during that half-cycle. Comparator 16 and multivibrator 17 are for producing pulses whenever the noisy cyclic signal exceeds the reference level during the negative half-cycle. NASA

N85-20248*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRECISION TUNABLE RESONANT MICROWAVE CAVITY Patent Application
Shigeo Nakanishi, Frank S. Calco, and August R. Scarpelli, inventors (to NASA) Filed 11 Feb. 1985 9 p
(NASA-Case-LEW-13935-1; NAS 1.71:LEW-13935-1;
US-Patent-Appl-SN-700255) Avail: NTIS HC A02/MF A01 CSCL 09A

A tunable microwave cavity containing ionizable metallic vapor or gases and an apparatus for precisely positioning a microwave coupling tip in the cavity and for precisely adjusting at least one dimension of the cavity are disclosed. With this combined structure, resonance may be achieved with various types of ionizable gases. A coaxial probe extends into a microwave cavity through a tube. One end of the tube is retained in a spherical joint attached in the cavity wall. This allows the coaxial probe to be pivotally rotated. The coaxial probe is slideable within the tube thus allowing the probe to be extended toward or retracted from the center of the cavity. A tunable wall in the cavity is precisely positioned by a plurality of threated rods extending through threaded bushings which are geared together. Thus, rotation of one of the bushings caused rotation of the other bushings simultaneously whereby the tuning wall is accurately positioned. Means are provided for moving the tube through which the coaxial probe extends in both a side to side and back and forth motion. NASA

N85-20249*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROCESSING CIRCUIT WITH ASYMMETRY CORRECTOR AND CONVOLUTIONAL ENCODER FOR DIGITAL DATA
Harold J. Pfiffner, inventor (to NASA) (Hughes Aircraft Co., Culver City, Calif.) 11 Sep. 1984 21 p Sponsored by NASA
(NASA-Case-MSC-20187-1; NAS 1.71:MSC-20187-1;
US-Patent-Appl-SN-649327) Avail: NTIS HC A02/MF A01 CSCL 09A

A processing circuit is provided for correcting for input parameter variations, such as data and clock signal asymmetry, phase offset and jitter, noise and signal amplitude, in incoming data signals. An asymmetry corrector circuit performs the correcting function and furnishes the corrected data signals to a convolutional encoder circuit. The corrector circuit further forms a regenerated clock signal from clock pulses in the incoming data signals and another clock signal at a multiple of the incoming clock signal. These clock signals are furnished to the encoder circuit so that encoded data may be furnished to a modulator at a high data rate for transmission. NASA

N85-20250*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF EXAMINING MICROCIRCUIT PATTERNS Patent Application
Stefan F. Suszko, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 13 Oct. 1983 19 p Sponsored by NASA
(NASA-Case-NPO-16299-1; NAS 1.71:NPO-16299-1;
US-Patent-Appl-SN-541526) Avail: NTIS HC A02/MF A01 CSCL 09C

Examination of microstructures of LSI and VLSI devices is facilitated by employing a method in which the device is photographed through a darkfield illumination optical microscope and the resulting negative subjected to inverse processing to form a positive on a photographic film. The film is then developed to form photographic prints or transparencies which clearly illustrate the structure of the device. The entire structure of a device may be examined by alternately photographing the device and selectively etching layers of the device in order to expose underlying layers. NASA

N85-20251*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR MEASURING MINORITY CARRIER LIFETIME IN A DIRECT BAND-GAP SEMICONDUCTOR Patent Application
Oldwig vonRoos, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 18 Dec. 1984 29 p
(Contract NAS7-918)
(NASA-Case-NPO-163371-1; NAS 1.71:NPO-163371-1;
US-Patent-Appl-SN-683111) Avail: NTIS HC A03/MF A01 CSCL 09C

A direct band-gap semiconductor is exposed to intensity-modulated photon radiation having a characteristic energy at least as great as the energy gap of the semiconductor. This produces a time dependent concentration of excess charge carriers through the material, producing a luminescence signal modulated at the same frequency as the incident radiation but shifted in phase by an amount related to the lifetime of minority carriers. In a preferred embodiment, the phase shift of the luminescence signal is determined by transforming it to a modulated electrical signal and mixing the electrical signal with a reference signal modulated at the same frequency and having a phase which is known relative to the incident radiation. Minority carrier lifetime is calculated by integrating a direct current component of the mixed signal (F sub dc) over a 2 pt range in phase of the reference signal. NASA

N85-20252# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA ELECTRONICA SINICA (SELECTED ARTICLES)
Z. Youwei, Z. Guchuan, and F. Ji-Chang 7 Nov. 1984 33 p Transl. into ENGLISH from Dianzi Xuebao (China), v. 11, no. 6, Nov. 1983 p 47-55, 57-63
(AD-A148829; FTD-ID(RS)T-1227-84) Avail: NTIS HC A03/MF A01 CSCL 12/1

The theory and simulation results of employing a Kalman filter in an airborne fire control radar tracking system was studied. Problems such as target dynamics modeling, linear filtering and simulation, linear filtering approximation, sensitivity simulation, maneuvering target tracking and adaptivity were considered. A modified Kalman filter for tracking a maneuvering target was presented. It detects a target maneuver by judging whether there is a bias in the observation residue. This estimate was used to correct the state prediction and error covariance. It worked as a single Kalman filter with its maneuver acceleration command at zero. A better compromise between the steady state filtering accuracy and fast response to maneuver was reached. Computer simulation results show that the accuracy of the filter is slightly superior to that of a complicated filter bank. G.L.C.

N85-20253# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
OPTICALLY BISTABLE DEVICES USING SEMICONDUCTOR MATERIALS Final Technical Report, Feb. 1982 - Feb. 1983
S. D. Smith, M. E. Prise, C. T. Seaton, F. A. P. Tooley, and C. R. Pidgeon Nov. 1984 30 p
(Grant AF-AFOSR-0149-82)

(AD-A149551; RADC-TR-84-229) Avail: NTIS HC A03/MF A01 CSCL 09/1

This report covers work conducted from February 1982 to February 1983 on the nonlinear optical properties of semiconductors using tunable (bandgap resonant) laser sources. Emphasis is on Carbon Dioxide (CO) Indium Antimonides (InSb) at 77K, but an optical parametric amplifier is constructed for future work on systems at shorter wavelengths. The Optical Bistability and device properties of InSb have been investigated. Operation of a slice of InSb, held at 77K, pumped by a continuous wave CO laser, as an optical AND gate, triggered by 30 ps pulses at wavelength 1.06 micron with energies of 5 nJ, is demonstrated. By using temporal separation of the trigger pulses, information on the carrier dynamics is obtained. The design and construction of an angle tuned Optical Parametric Amplifier consisting of a lithium niobate crystal pumped by a 30 ps pulse from a neodymium YAG laser has been achieved. GRA

N85-20254# Department of the Air Force, Washington, D.C.
TALLY CELL CIRCUIT Patent Application
J. L. Burrows, inventor (to Air Force) Filed 22 Aug. 1984 13 p
(AD-D011492; US-Patent-Appl-SN-643203) Avail: NTIS HC A02/MF A01 CSCL 09/1

A tally cell circuit for counting the number of logical ones in an input signal utilizing a parallel-series combination of four Complementary Metal Oxide Semiconductor field effect transistors is described. The number of input ones in the input are expressed in a binary code at the output of the tally cell circuit. Author (GRA)

N85-20255# Department of the Air Force, Washington, D.C.
HIGH VOLTAGE RF COAXIAL CABLE Patent Application
R. J. Tippie, inventor (to Air Force) Filed 11 Oct. 1984 10 p
(AD-D011493; US-Patent-Appl-SN-659920) Avail: NTIS HC A02/MF A01 CSCL 09/1

A high voltage coaxial cable wherein a corona-free configuration is produced by applying a room temperature-cured silicone elastomeric material under pressure to the outer surface of the cable braid so that the material is forced between the voids of the braid and adheres to the primary insulation material at the insulation/braid interface is described. Author (GRA)

N85-20256# Maxwell Labs., Inc., San Diego, Calif.
REP RATED LONG LIFE CAPACITOR DEVELOPMENT: PHASE 1 AND 2 Final Report, 1 April 1981 - 31 May 1984
Irvin Galperin, W. White, K. Haskell, and J. Ennis Sep. 1984 97 p
(Contract DE-AC04-81AL-16320)
(DE85-000719; MLR-1807) Avail: NTIS HC A05/MF A01

Polypropylene and polyolefin resins were characterized and processed into capacitor films. New capacitor films were developed--a post oriented processed, two layer polypropylene film and upgraded polyolefin film. Criteria for judging film quality were developed. Field life data were verified with paper/polypropylene capacitors on the Maxwell rep rate facility. A11 polypropylene film capacitors were developed with lifetimes in excess of 10 to the 7th power discharges at energy densities for the finished capacitor of 18.3 J/lb and projected to more than 20 J/lb. DOE

N85-20257# Argonne National Lab., Ill. Electromagnetic Technology Group.
ALL SOLID STATE HIGH VOLTAGE POWER SUPPLY FOR NEUTRAL BEAM SOURCES
Walter F. Praeg 14 Sep. 1984 7 p refs Presented at the 13th Symp. on Fusion Technol., Varese, Italy, 24 Sep. 1984
(Contract W-31-109-eng-38)
(DE85-002531; CONF-840915-9) Avail: NTIS HC A02/MF A01

The conceptual design of a high frequency solid state, high power, high voltage power system that reacts fast enough to be compatible with the requirements of a neutral beam source is presented. The system offers the potential of significant advantages over conventional power line frequency systems, such as high reliability, long life, relatively little maintenance requirements, compact size, and modular design. DOE

N85-20258# Stanford Linear Accelerator Center, Calif.
DESIGN OF A SEMI-CUSTOM INTEGRATED CIRCUIT FOR THE SLAC SLC TIMING CONTROL SYSTEM
Eric Linstadt Oct. 1984 2 p refs Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. 1984
(Contract DE-AC03-76SF-00515)
(DE85-003091; SU-SLAC-PUB-3476; CONF-841007-29) Avail: NTIS HC A02/MF A01

A semicustom (gate array) integrated circuit has been designed for use in the SLAC linear collider timing and control system. The design process and SLAC's experiences during the phases of the design cycle are described. Issues concerning the partitioning of the design into semicustom and standard components are discussed. Functional descriptions of the semicustom integrated circuit and the timing module in which it is used are given. DOE

N85-20259# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRONICS ENGINEERING DEPARTMENT: EE TECHNICAL REVIEW
Nov. 1984 38 p
(Contract W-7405-eng-48)
(DE85-004360; UCRL-50025-84-3) Avail: NTIS HC A03/MF A01

Brief summaries are given of electronics engineering work in the areas of: an automated ultrasonic test bed, design and operation of an ion cyclotron radio frequency system for the TMX-U, high speed solid state switches, and polarizing holographic reflector for electron cyclotron resonant heating on the Tandem Mirror Experiment Upgrade. DOE

N85-20260# CETA Corp., Mountain View, Calif.
15KW POWER SUPPLY DEVELOPMENT Final Report
Mar. 1984 48 p
(Contract W-7405-eng-48)
(DE85-001057; UCRL-15625) Avail: NTIS HC A03/MF A01

The program for development of a 15KW power supply is reviewed. Results are summarized, circuits developed are described, and an operation manual is presented. DOE

N85-20261# Fermi National Accelerator Lab., Batavia, Ill.
CALCULATION OF TRANSMISSION LINE IMPEDANCES USING THE ANSYS FINITE ELEMENT PROGRAM
Marvin E. Johnson 29 Jun. 1984 18 p ref
(Contract DE-AC02-76CH-03000)
(DE84-016715; FNAL-TM-1270) Avail: NTIS HC A02/MF A01

Numerical techniques for calculating the capacitance of an arbitrary two conductor structure are discussed. For two dimensional structures the capacitance per unit length can be easily related to the characteristic impedance of a transmission line with the same cross section. Note that this is true for lines operated below their cut off frequency, i.e., TEM mode only. Thus, one can compute the impedance of an arbitrarily shaped line. The method using the ANSYS finite element program is being used to design the high voltage transmission line for the Yale streamer chamber. This line has a transition piece between two different cross sections. It is being modeled by taking several slices throughout the transition region. DOE

N85-20262# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRICAL RESISTANCE MEASUREMENTS OF METALS TO 40 GPa IN THE DIAMOND CELL
Robin Reichlin Sep. 1984 7 p refs Presented at Condensed Matter Phys., Aussois, France, 10-14 Sep. 1984
(Contract W-7405-eng-48)
(DE85-001009; UCRL-91473; CONF-8409145-2) Avail: NTIS HC A02/MF A01

A four probe technique was developed for measuring electrical resistances of metals to 40.0 GPa in a diamond anvil cell. Several gasketing techniques are presented which provide the necessary support for the diamonds and the electrical leads at the diamond edges. Electrical resistance data are presented for iron and bismuth. A comparison is made between electrical

resistance measurements made on bismuth under hydrostatic and nonhydrostatic conditions. DOE

N85-20263# Stanford Linear Accelerator Center, Calif.
PROPOSAL FOR HOLLOW CATHODE ELECTRON GUN FOR ELECTRON COOLING
Frank Krienen and W. B. Herrmannsfeldt Sep. 1984 4 p refs Presented at the Workshop on Electron Cooling, Karlsruhe, West Germany, 24-26 Sep. 1984
(Contract DE-AC03-76SF-00515)
(DE85-002721; SU-SLAC-PUB-3445; CONF-8409171-1) Avail: NTIS HC A02/MF A01

A magnetic shunt, an iron plate with a hole in it, sandwiched between two solenoids which are polarized in opposite direction, can shape the resulting magnetic field. Putting a voltage between the magnetic shunt and two conducting plates perpendicular to the z axis in a symmetric fashion, produces the same shape of the electric field, because both E and B may be derived as gradient of a potential. This simple physical system, in which E and B are everywhere parallel is explored in an effort to obtain low temperature, magnetically confined electron beams. DOE

N85-20264# Stanford Research Inst., Menlo Park, Calif. Engineering Sciences Lab.
SEMICONDUCTOR ELECTROCHEMISTRY APPROACH TO THE STUDY OF OXIDE FILMS ON NICKEL ELECTRODES Final Report
M. J. Madou, S. Wing, and M. C. H. McKubre Sep. 1984 77 p refs
(Contract DE-AC03-76SF-00098)
(DE85-003042; LBL-18413) Avail: NTIS HC A05/MF A01

Impedance measurements and photoeffect studies on nickel electrodes were carried out to characterize the oxide films on such electrodes. It was found that an n-type or p-type semiconducting oxide can be present at the surface of a nickel electrode. Impedance measurements show that a solid-state diffusion process, presumably of protons through the oxide film, dominates the impedance behavior for the charged electrode; for the discharged electrode, the impedance behavior is dominated by the space charge inside the p-type oxide. By using semiconductor electrochemistry techniques, fundamental insights about the kinetics of battery electrodes can be obtained. All the additives tested are impurities that influence battery performance; some for the better, most for the worse. R.S.F.

N85-20265# California Univ., Livermore. Lawrence Livermore Lab.
ADAPTATION OF AN AIR-DIELECTRIC RF CABLE FOR USE AS AN OIL-FILLED HIGH VOLTAGE PULSE TRANSMISSION LINE
W. C. Weiss, R. L. Copp, L. L. Reginato, and J. A. Schmidt Nov. 1984 7 p refs Presented at the Intern. Wire and Cable Symp., Reno, Nev., 13-15 Nov. 1984
(Contract W-7405-eng-48; DARPA Order 4395)
(DE84-017414; UCRL-90670; CONF-8411103-1) Avail: NTIS HC A02/MF A01

The specifications, conceptual design, prototype testing and operating experience of an oil-filled high voltage pulse transmission cable adapted from commercially available air-dielectric RF components are described. Lawrence Livermore National Laboratory's Advanced Test Accelerator (ATA) requires a method of transmitting 250kV, 70 nanosecond pulses from the power conditioning equipment to the accelerator. The oil-filled cable approach was chosen over alternative concepts because of its high voltage holding capacity, long life and flexibility. The criteria for cable and connector design are discussed. The results of prototype testing and performance of the final design are presented. DOE

N85-20266# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
SIGNAL PROPAGATION DELAY, WIRE LENGTH DISTRIBUTION AND THE EFFICIENCY OF VLSI CIRCUITS
Paul M. B. Vitanyi Jul. 1984 14 p refs Submitted for publication
(CWI-CS-R8412; B8475628) Avail: NTIS HC A02/MF A01

Signal propagation delay in long wires of VLSI circuits is discussed. There are wire length distributions for which the logarithmic delay assumption entails at least an exponential increase in area over the constant wire width assumption for any layout with that distribution. Consequently, the wires need to get so much longer to achieve logarithmic delay that the absolute propagation delay turns out to be not improved over an original linear or quadratic propagation delay. Given that the wide wires have to be actually placed in a layout, the logaritmic delay requirement may not be implementable at all, and even if it could it would give no improvement in absolute time. Author (ESA)

N85-20267# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
CIRCUIT TOPOLOGY, SIGNAL PROPAGATION DELAY AND THE EFFICIENCY OF VLSI CIRCUITS
Paul M. B. Vitanyi Aug. 1984 22 p refs Submitted for publication
(CWI-CS-R8414; B8475625) Avail: NTIS HC A02/MF A01

The effect of signal propagation delay and circuit topology on VLSI circuit performance is discussed. Topologies with the same function such that a circuit topology which is optimal under one delay assumption is suboptimal under another exist. Under constant signal propagation delay, or logarithmic delay, systolic search trees or fast permutation networks can be laid out to perform better if constant width wires are assumed. However, under logarithmic signal propagation delay with the required constant aspect ratio for wires the naive mesh layout is superior over every tree layout with respect to area and period. For the fast fourier transform, the naive mesh layout is superior over every layout for a fast permutation network like the cube-connected cycles in area, area x period and the area x execution time. For a complete N-node binary tree, with the wire aspect ratio and number of layers constants independent of N, it is impossible to lay out a complete N-node binary tree using equal length wires. Author (ESA)

N85-20209# Joint Publications Research Service, Arlington, Va.
HIGH QUALITY SUPER-LARGE CIRCUITS DEVELOPED Abstract Only
In its China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 70 Transl. into ENGLISH from Xinhua (China), 8 Nov. 1984 n.p. (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20221# Joint Publications Research Service, Arlington, Va.
METHOD FOR INCREASING LINEARITY OF LOAD CELL
Wu Xianyi *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-040) 6 Dec. 1984 p 73-78 Transl. into ENGLISH from Yiqi Yibiao Xuebao (Beijing), no. 1, 1984 p 103-106 (For primary document see N85-20219 11-31)
Avail: NTIS HC A07/MF A01

N85-20687# Joint Publications Research Service, Arlington, Va.
LONG-RANGE ELECTRONICS PROGRAM OUTLINED
Stanislaw Stepien *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-85-006) 17 Feb. 1985 p 84-94 Transl. into ENGLISH from Przeglad Tech. (Warsaw), no. 46, 13 Nov. 1983 p 10-13 (For primary document see N85-20684 11-60)
Avail: NTIS HC A05/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-20268 National Maritime Inst., Feltham (England).
A SURVEY OF THE TURBULENT DRAG REDUCTION USING

PASSIVE DEVICES
Kwing-So Choi Jul. 1984 49 p refs Sponsored by UK Ministry of Defence Procurement Executive
(NMI-R-193) Copyright. Avail: Issuing Activity

Turbulent skin friction drag reduction using large eddy break-up devices (LEBU) and riblets is reviewed. Drag reductions of turbulent boundary layers are observed from riblets whose height and width range from 10 to 100 and 10 to 200 viscous lengths, respectively; the maximum reduction is obtained from riblets with cusped peaks and semicircular valleys of 15 viscous lengths in height and width. Drag reduction of turbulent boundary layers using riblets is due to the local increase of the effective kinematic viscosity in the buffer layer caused by forcing the fluid to flow across the ridges of riblets. An optimum configuration of LEBU consists of 2 thin flat plates with lengths, heights, and spacing being 1, 0.8, and 5 to 8 boundary layer thicknesses, respectively. Turbulent drag reduction using LEBU is due to the passive and dynamic effect of the momentum deficit region of the wake created by the devices suppressing turbulent energy production. Author (ESA)

N85-20269*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW VISUALIZATION STUDY OF THE EFFECT OF INJECTION HOLE GEOMETRY ON AN INCLINED JET IN CROSSFLOW
Frederick F. Simon and Michael L. Ciancone 1985 26 p refs To be presented at the Symp. on Transport Phenomena in Rotating Machinery, held in Honolulu, Hi., 28 Apr. - 3 May 1985; sponsored in part by Michigan Univ., Hawaii Univ., ASME, Gas Turbine Society of Japan, and the Turbomachinery Society of Japan
(NASA-TM-86936; E-2450; NAS 1.15:86936) Avail: NTIS HC A03/MF A01 CSCL 20D

A flow visualization was studied by using neutrally buoyant, helium-filled soap bubbles, to determine the effect of injection hole geometry on the trajectory of an air jet in a crossflow and to investigate the mechanisms involved in jet deflection. Experimental variables were the blowing rate, and the injection hole geometry cusp facing upstream (CUS), cusp facing downstream (CDS), round, swirl passage, and oblong. It is indicated that jet deflection is governed by both the pressure drag forces and the entrainment of free-stream fluid into the jet flow. For injection hole geometries with similar cross-sectional areas and similar mass flow rates, the jet configuration with the larger aspect ratio experienced a greater deflection. Entrainment arises from lateral shearing forces on the sides of the jet, which set up a dual vortex motion within the jet and thereby cause some of the main-stream fluid momentum to be swept into the jet flow. This additional momentum forces the jet nearer the surface. Of the jet configurations, the oblong, CDS, and CUS configutations exhibited the largest deflections. The results correlate well with film cooling effectiveness data, which suggests a need to determine the jet exit configuration of optimum aspect ratio to provide maximum film cooling effectiveness. EAK

N85-20270*# North American Aviation, Inc., Torrance, Calif.
FLOW THROUGH VERY POROUS SCREENS
Paul A. Durbin and Kenneth K. Muramoto Mar. 1985 13 p refs
(NASA-TP-2436; E-2360; NAS 1.60:2436) Avail: NTIS HC A02/MF A01 CSCL 20D

Flow through and around screens with small resistance coefficient were analyzed. Both steady and oscillatory flows are considered, however, the case of a screen normal to the flow is treated. At second order in the asymptotic expansion the steady flow normal to the screen is nonuniform along the screen, due to components induced by the wake and by tangential drag. The third order pressure drop is nonuniform and the wake contains distributed vorticity, in addition to the vortex sheet along its boundary. The unsteady drag coefficient is found as a function of frequency. E.A.K.

N85-20271# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.
A NEW METHOD FOR CALCULATING THE FLOW FIELD IN A DUMP COMBUSTOR Final Report, 15 May 1983 - 15 Aug. 1984
E. F. Brown and A. A. Hale 15 Aug. 1984 65 p
(Grant AF-AFOSR-0178-83)
(AD-A149305; AFOSR-84-1165TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

A combined elliptic/parabolic scheme was developed in which the elliptic code, STARPIC, was only used for the recirculation region of a dump combustor. Downstream of the recirculation region the parabolized form of the Navier-Stokes equation was used. The code written for this region used an architecture similar to that found in STARPIC. These programs were then combined producing what we call a hybrid code. Calculations were run in a dump combustor having an area ratio of approximately four. Comparisons were made of the radial profiles of velocity and turbulence kinetic energy with both the totally elliptic calculations and with experiment. In all cases the hybrid method agreed with the experiments at least as well as the elliptic calculations, and in most cases showed even better agreement. Results indicate that an order of magnitude savings in both computational time and machine storage can be achieved if the hybrid method is used. Author (GRA)

N85-20272# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Section.
INITIAL VELOCITY OF THE EMERGING FREE BOUNDARY IN A TWO-PHASE STEFAN PROBLEM WITH IMPOSED FLUX
A. D. Solomon, V. Alexiades (Tennessee Univ., Knoxville), and D. G. Wilson Nov. 1984 33 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003813; ORNL-6073) Avail: NTIS HC A03/MF A01

The one dimensional, two phase Stefan problem with an imposed flux in which the phase change front originates at the material boundary was considered. It is proven that, subject to suitable assumptions on the initial temperature and imposed flux, the initial speed of the phase change front is equal to the jump between the surface and initial fluxes at the boundary. Similarly, it is shown that the front X(t) is continuously differentiable in the closed interval (0,t*) for some t* more than 0. DOE

N85-20273# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
THICKNESS EFFECT IN LOW-DENSITY INSULATION
Patrick J. Burns Aug. 1984 47 p refs Sponsored in part by National Bureau of Standards
(Contract DE-AI01-76PR-06010)
(DE85-003065; NBSIR-84-2906) Avail: NTIS HC A03/MF A01

The theory of heat transfer in low density, glass fiber insulation via conduction, convection, and radiation is discussed. It is concluded that the primary modes of heat transfer in this material are air conduction and radiation. An analysis of NBS data of measured apparent thermal conductivity for different thicknesses resulted in a parameter estimate of the optical extinction coefficient. This parameter determines the amount of change in apparent thermal conductivity as a function of sample thickness. This phenomena is referred to as the thickness effect. DOE

N85-20274# California Univ., Berkeley. Lawrence Berkeley Lab. Building Ventilation and Indoor Air Quality Program.
FORMALDEHYDE AND TRACER GAS TRANSFER BETWEEN AIRSTREAMS IN ENTHALPY-TYPE AIR-TO-AIR HEAT EXCHANGERS
William J. Fisk, Brian S. Pedersen, Dariusch Hekmat, Raymond E. Chant, and Hossein Kaboli Jul. 1984 34 p refs Presented at the ASHRAE Symp. on Field Measurements of Heat Transfer in Building Envelopes, Chicago, 27 Jan. 1985
(Contract DE-AC03-76SF-00098)
(DE84-016951; LBL-18149; CONF-850105-2) Avail: NTIS HC A03/MF A01

The formaldehyde, tracer gas, and water vapor transfer rates in two enthalpy exchangers were measured. The first exchanger uses a cross flow fabricated from a treated paper. The core of

the second heat exchanger is a rotating heat wheel coated with lithium chloride. To reduce the transfer of gases by air leakage each core was installed in a specially fabricated case. Only 5% to 8% of the two tracer gases and 7% to 15% of the formaldehyde injected into the exhaust airstream was transferred to the supply airstream. Therefore, formaldehyde transfer between airstreams by processes other than air leakage does not seriously compromise the performance of these enthalpy exchangers. Theoretical calculations indicate, however, that the transfer of water vapor between airstreams in enthalpy exchangers can significantly diminish their ability to lower indoor formaldehyde concentrations because of the positive coupling between indoor humidity and the emission rates of formaldehyde from building materials. DOE

N85-20275# Mechanical Technology, Inc., Latham, N. Y.
DEVELOPMENT AND TEST OF A HIGH COP RANKINE HEAT PUMP FOR GENERATION OF PROCESS STEAM. PHASE 2: FABRICATION AND TEST Final Report
J. A. Smoak and W. F. Koebbeman Oct. 1984 60 p
(Contract DE-AC07-77CS-40074)
(DE85-002600; DOE/CS-40074/T1) Avail: NTIS HC A04/MF A01

The steps taken to assemble and test the Rankine-driven heat pump are described. The following were performed: component bench tests, skid assembly, skid tests, system assembly, preliminary (cold) tests, alarms and safeties checkout, and hot tests. The test configurations are presented. Results are discussed for performance, endurance, and special tests. The systems cost analysis is also included. DOE

N85-20276# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
MAGNETIC HEAT PUMP FEASIBILITY ASSESSMENT
Lance D. Kirol, James L. Mills, Keith S. Fullmer, and John N. Zabriskie Oct. 1984 279 p refs
(Contract DE-AC07-76ID-01570)
(DE85-002806; EGG-2343) Avail: NTIS HC A13/MF A01

The feaxibility of using magnetic heat pumps in high temperature (to 500 K) industrial applications was studied. The heat pumps were very attractive from a technical viewpoint, but not yet economically feasible. There is good potential for achieving cost reductions necessary to realize economic feasibility. Superconducting magnets, cryogenic cooling for the superconducting magnets, and working materials are the major cost items. Computer simulations were used to quantify magnetic heat pump performance, and theoretical working material properties were used. Further work will include laboratory determination of material properties and verification of heat pump performance. DOE

N85-20277# Kanner (Leo) Associates, Redwood City, Calif.
TRIPLE LAYER SYSTEM FOR NUMERICAL INTEGRATION OF EQUATIONS OF GAS DYNAMICS AND NONLINEAR HEAT CONDUCTION EQUATION
A. I. Zuev 1984 12 p refs Transl. into ENGLISH from Zh. Vychislitelnoi Mat. i Mat. Fiz., Suppl. (Moscow), v. 6, no. 4, 1966 p 230-236 Original language document was announced in IAA as A68-44033
(Contract W-7405-eng-36)
(DE85-000297; LA-tr-84-49) Avail: NTIS HC A02/MF A01

The triple layer imlicit system of through count for equations of gas dynamics is examined. The method of construction of multi-layer systems that provide for preserving the order of approximation at time irregular network is shown. The solution of system of difference equations of gas dynamics is used as an example for describing the iterational method which combines fast convergence of iterations of the Newton's method, logical simplicity and economical efficiency of the method of pass and the method of group relaxation. The results of calculations according to the suggested system are presented. The comparison of three difference systems is made on the example of numerical calculation of the generalized solution of the heat conduction equation. DOE

N85-20278# Los Alamos Scientific Lab., N. Mex.
NUMERICAL SIMULATION OF TURBULENT REACTING FLOWS
Larry Cloutman 1984 9 p refs Presented at the Intern. Conf. on Advan. in Numerical Methods in Eng. Theory and Appl., Swansea, England
(Contract W-7405-eng-36)
(DE84-016777; LA-UR-84-2749; CONF-850116-1) Avail: NTIS HC A02/MF A01

A multidimensional, transient computational fluid dynamics algorithm has been developed for simulation of reacting flows in automotive engines. We describe the basic features of the method and present several numerical solutions obtained with it. DOE

N85-20279# Sandia Labs., Albuquerque, N. Mex.
ANALYSIS OF THE NATURAL INITIATION OF VAPOR EXPLOSIONS
A. Drew Oct. 1984 20 p refs
(Contract DE85-000188; SAND-84-1732)
(DE85-000188; SAND-84-1732) Avail: NTIS HC A02/MF A01

A model for the initiation phase, which occurs after liquid metal has broken up into droplets, but before the actual explosion is presented. During this time, the liquid metal droplets heat the coolant liquid by radiation across a vapor layer. The droplets cool and the vapor layer decreases in thickness until either direct contact is made or until the dynamics of the vapor film result in instabilities which in turn lead to almost instantaneous boiling. DOE

N85-20280# Los Alamos Scientific Lab., N. Mex. Computing and Communications Div.
NATURAL CONVECTION HEAT TRANSFER BETWEEN ARRAYS OF HORIZONTAL CYLINDERS AND THEIR ENCLOSURE
R. A. Weaver and R. O. Warrington (Louisiana Technical Univ., Ruston) 1984 8 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-7405-eng-36)
(DE85-003773; LA-UR-84-3651; CONF-841201-22) Avail: NTIS HC A02/MF A01

The natural convection heat transfer between arrays of horizontal, heated cylinders and their isothermal, cooled enclosure was experimentally investigated. Four different cylinder arrays were used: two in-line and two staggered. Four fluids (air, water, 20 cs silicone, and 96% glycerine) were used with Prandtl numbers ranging from 0.705 to 13090.0. There was no significant change in the Nusselt number between isothermal and constant heat flux conditions of the cylinder arrays. The average heat transfer coefficient was most affected by the spacing between cylinders and the total surface area of the cylinder arrays. The enclosure reduced the expected increase in both the average and the local heat transfer coefficients caused increase in both the average and the local heat transfer coefficients caused by changing the inner body from an in-line arrangement to a staggered arrangement of comparable spacing. An increase in fluid viscosity reduced the influence of the geometric effects. DOE

N85-20281# GA Technologies, Inc., San Diego, Calif.
ACOUSTIC RESONANCE IN HEAT EXCHANGER TUBE BANKS Annual Report
R. D. Blevins Nov. 1984 59 p refs
(Contract DE-AT03-82ER-12023; GA Proj. 3384)
(DE85-004395; GA-A-17779; AR-2) Avail: NTIS HC A04/MF A01

Fluid mechanics of acoustic resonance in heat exchanger tube bundles continues. Data and theory, development of models for the acoustics of tube bundles, and construction of a wind tunnel and tube array model were previously reviewed. In the present phase of the problem, both the wind tunnel model and the analytical model were exercised. Using the wind tunnel, the ability of coherent sound to shift the natural frequency of vortex shedding was demonstrated. Sound at the vortex shedding frequency can also increase the magnitude of the shed vortex and increases the spanwise coherence. Acoustic resonance due to vortex and shedding from tube arrays was observed. The acoustic mode of

the resonance was measured, and it is found to agree well with analytical predictions. Work on development of a nonlinear dynamic model for vortex shedding has been initiated. This model features coupled nonlinear oscillators that will simulate the sound-induced entrainment phenomena. DOE

N85-20282# Los Alamos Scientific Lab., N. Mex.
FRAGMENTATION AND TURBULENCE IN COLLAPSING GAS CLOUDS
W. Benz 30 Oct. 1984 35 p refs Presented at Am. Astrophys. Soc. Meeting, Tucson, Ariz., 13 Jan. 1985
(Contract W-7405-eng-36)
(DE85-003745; LA-UR-84-3469; CONF-850135-1) Avail: NTIS HC A03/MF A01

Four simulations of the collapse of uniformly rotating isothermal gas clouds using the smoothed particle hydrodynamics method to solve the hydrodynamical equations are presented. In all cases the result is a central disk-like massive object surrounded by many less massive fragments located in the equatorial plane, collapsing on their own and carrying most of the angular momentum. The origin of these structures is found to be Jeans and Rayleigh-Taylor instabilities seeded from a small random initial perturbation spectrum. It is also shown that in each simulation turbulent motions are generated from the input of gravitational energy. By analyzing these motions it was found that a turbulent spectrum with a slope about 0.5 always develops very rapidly and remains constant through the rest of the collapse. Only a very little dependence on initial conditions of this slope was found. It is shown that turbulence may slow down the collapse by a factor up to 10(3), and that the time scale for turbulence dissipation is a better characteristic time scale for star formation than the free-fall time. It is also suggested that the roughly constant initial mass function found in various regions may be a result of the turbulence. DOE

N85-20283# Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Transport Theory and Mathematical Physics.
APPLIED MATHEMATICS OF TRANSPORT THEORY Progress Report, 1 Dec. 1983 - 30 Nov. 1984
William Greenberg and Paul F. Zwiefel 1984 173 p refs
(Contract DE-AS05-80ER-10711)
(DE85-000848; DOE/ER-10711/4) Avail: NTIS HC A08/MF A01

Substantial progress is reported on: (1) abstract transport theory; (2) computational analysis; (3) acceleration methods for transport iteration calculations; and (4) transport with nonnormal generators. The direction of current and future research is indicated and publications are listed. DOE

N85-20284# Argonne National Lab., Ill.
THREE-DIMENSIONAL ANALYSIS OF HEAT TRANSFER AND GAS FLOW IN A RADIANT FURNACE
R. W. Lyczkowski, C. S. Wang, G. F. Berry, I. S. H. Chow, and T. R. Johnson 1984 41 p refs Presented at ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-011732; CONF-841201-7) Avail: NTIS HC A03/MF A01

The three-dimensional steady-state fluid flow and temperature patterns in an experimental magnetohydrodynamic (MHD) radiant furnace were analyzed using the COMM-1A computer program. These results, together with a transient three-dimensional tracer simulation were used to develop a model for characteristics residence times and temperatures. This model was used with the KINE computer code to interpret experimental nitric oxide (NO) decomposition rates. Good agreement with such data demonstrated the usefulness of the methodoloyg for interpreting various experimental gas reaction data related to radiant furnaces, and as an aid in the design of high temperature furnaces and boilers of unconventional or severe service. Specifically, the performance of the radiant furnace section of the University of Tennessee Space Institute (UTSI) Coal-Fired Flow Facility (CFFF) was analyzed. DOE

N85-20285# California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
CONVECTION HEAT TRANSFER IN THE CRITICAL REGION OF FLUID MIXTURES Progress Report, Jan. - Sep. 1984
E. Marschall Sep. 1984 14 p
(Contract DE-AT03-84ER-13164)
(DE85-001282; DOE/ER-13164/T2) Avail: NTIS HC A02/MF A01

An experimental apparatus for measuring heat transfer rates and heat transfer coefficients in the critical region of pure fluids and fluid mixtures is described. R.S.F.

N85-20286# Oak Ridge National Lab., Tenn.
THEORETICAL AND EXPERIMENTAL ANALYSIS OF VERTICAL, CONCENTRIC-TUBE GROUND-COUPLED HEAT EXCHANGERS
V. C. Mei and S. K. Fischer Oct. 1984 68 p refs
(Contract DE-AC05-84OR-21400)
(DE85-000474; ORNL/CON-143) Avail: NTIS HC A04/MF A01

An experimental and analytical project to study the design of vertical, concentric-tube ground-coupled heat exchangers for use in heat pump applications is described. A mathematical model was developed and converted into a computer program to simulate the operation of the ground-coupled heat exchanger. The experimental apparatus consisted of a concentric configuration of two 47.2-m (155-ft) polyvinyl chloride (PVC) pipes (sealed at both ends with connections so that hot or cold water could be pumped through the system) with instrumentation to measure heat transfer. This heat exchanger was placed in a 0.20-m (8-in.) inside diameter (ID) well and backfilled with sand to establish good thermal contact with the surrounding ground. Heat transfer was measured for heat exchanger operation under several sets of operating conditions. Data collected using the experimental apparatus were used to validate the computer program, and the computer model was then used to study the effects of variations in heat exchanger length and diameter, flow rate, and tube and ground thermal conductivities on the heat exchanger performance. Results are presented. DOE

N85-20287# Karlsruhe Univ. (West Germany). Forschungsbereich Numerische Stroemungsmechanik.
COMPUTATION OF THE INVISCID VELOCITY POTENTIAL FOR GENERAL ELLIPSOIDS ON A NEARLY QUADRATIC SURFACE GRID
K. Haefele and W. Schoenauer Sep. 1984 102 p refs In GERMAN; ENGLISH summary
(Rept-25/84) Avail: NTIS HC A06/MF A01

The allocation of input data to calculate stream line - potential line coordinates on spheroids is described. A nearly quadratic surface grid was determined with help of parallel cuts through the spheroid and uniform distribution of points on the intersecting ellipses. After generating a satisfactory grid, the inviscid velocity potential is calculated analytically at each grid point. Grid points and corresponding velocity potential values yield the required input data for a streamline calculation. All computer programs are given. Author (ESA)

N85-20288# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
A STUDY OF DEGENERATE AND NONDEGENERATE CRITICAL POINTS IN THREE-DIMENSIONAL FLOW FIELDS
Anthony Edward Perry (Melbourne Univ.) Oct. 1984 64 p refs
(DFVLR-FB-84-36; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 16

Critical point theory is applied to incompressible flow. Degenerate critical points are emphasized. It is found that free-slip critical points (away from a no-slip boundary) are degenerate if the vorticity is finite. Such flows are found to be locally two-dimensional unless the flow is unsteady or the viscosity is finite. Viscous effects appear only in higher-order terms of the series expansion for velocity. They change the character of the first-order solution. No-slip critical points can have asymptotically exact nondegenerate first order solutions for the ratio of local flow velocity to normal distance from the wall. Author (ESA)

N85-20289# Karlsruhe Univ. (West Germany). Sonderforschungsbereich 84.
CALCULATION OF OSCILLATING TURBULENT FLOWS IN OPEN CHANNELS
Rodi Celik, W. I. Mar. 1984 23 p refs Sponsored by Deutsche Forschungsgeimschaft
(KU-SFB-80/T/228) Avail: NTIS HC A02/MF A01

An alternating-direction implicit type finite difference method is used to calculate the vertical structure of oscillatory turbulent flows in two-dimensional open channels. The free surface elevation is determined by using, for each time step, the Leap-Frog method is the first half step and an implicit method at the second half step. The turbulent shear stress is calculated with the k-epsilon turbulence model. Turbulent flow in a laboratory estuary model with one end closed is simulated with the numerical model, and the results are compared with the corresponding flume and field measurements. The influence of frequency and roughness is investigated. The results indicate that the time and space variation of the velocity field and the phase log between the surface slope and the horizontal velocity can be predicted satisfactorily in oscillatory turbulent flows. Author (ESA)

N85-20290# Karlsruhe Univ. (West Germany). Sonderforschungsbereich 210.
LASER DOPPLER ANEMOMETRY (LDA) SIGNAL TRIGGERING AND EFFECTIVE PARTICLE SIZE RANGE
B. Ruck Sep. 1984 25 p refs Sponsored by Deutsche Forschungsgeimschaft
(KU-SFB-210/E/5) Avail: NTIS HC A02/MF A01

The influence of laser Doppler anemometer (LDA) signal triggering on the resultant LDA-information is discussed. It is shown that for highly turbulent flow configurations the triggering of the high pass filtered LDA-signal delivers the most exact flow information, since mainly small particles contribute to the resultant LDA-information. These particles show a minimum slip and a maximum ability to follow high, frequent, flow fluctuations. It is proved that triggering of unfiltered LDA-signals is not practical for data evaluation since the resultant LDA-information is dominated by bigger particles suspended in the flow. Triggering based on unfiltered LDA-signals, furthermore, uses the particle size distribution in the flow very ineffectively, i.e., results in low data rates, despite the existence of many small particles. Author (ESA)

N85-20291 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
FLUID SLOSH DYNAMICS OF SURFACE TENSION TANKS IN THREE AXIS STABILIZED SPACECRAFT
H. G. Beig and E. Hornung 1984 23 p Presented at INTELSAT/ESA Workshop on Dyn. Effects of Liquids on Spacecraft Altitude, Wash. D.C., Apr. 1984
(MBB-UR-E-739-84-O) Avail: Issuing Activity

A method for investigating propellant-tank interaction, satellite-tank interaction, and dynamic behavior of propellant in the tank is summarized. Sloshing with small and large amplitudes, and movement in bulks are considered. The ERNO MAUS tank experiment (EMTE) is described. The EMTE is a spaceborne experiment to study the dynamic behavior, orientation, and stability of liquids in tanks in reduced gravity. The sinusoidal excitation setup, and measurement and observation systems are outlined. Integration in a TEXUS rocket is illustrated. Author (ESA)

N85-20292# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
EVALUATION OF TIME INTEGRATORS FOR THE SHALLOW WATER EQUATIONS
F. W. Wubs Jun. 1984 37 p refs Sponsored by Netherlands Foundation for Technical Research, and Netherlands Organization for the Advancement of Pure Research
(CWI-NM-R8406; B8475633) Avail: NTIS HC A03/MF A01

The efficiency of low-order and high-order time integrators and the efficiency of implicit methods versus explicit methods for the shallow water equations were compared. The high-order Runge Kutta 4 method is more efficient than low order methods like Leap-Frog and the stabilized Runge-Kutta method, because the extra F evaluations are compensated by a large stability region and fourth-order accuracy. The fourth-order accuracy is essential to remain accurate with respect to second-order methods, when the largest possible timestep is used. When for accuracy reasons the timestep is inside the stability region, the Runge-Kutta 4 method is more efficient, otherwise the implicit method is more efficient. This is especially the case if the solutions are almost stationary. Conclusions are tentative because the influence of the error due to space discretization, which may partly offset the shown error, is not included. Author (ESA)

N85-20293# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
HIGH ORDER DIFFERENCE SCHEMES WITH REDUCED DISPERSION FOR HYPERBOLIC DIFFERENTIAL EQUATIONS
P. J. vanderHouwen and B. P. Sommeijer Jul. 1984 29 p refs Submitted for publication
(CWI-NM-R8408; B8475634) Avail: NTIS HC A03/MF A01

Difference schemes for systems of first order hyperbolic differential equations in two space dimensions in which the spatial discretizations are fourth order accurate; the time discretization is of explicit Runge-Kutta type and is also fourth order accurate; the scaled stability boundary is root 2/2; and the weights in the space discretizations and the Runge-Kutta parameters can be adapted to reduce the dispersion of the dominant Fourier components in the solution are investigated. The method is illustrated by applying it to the shallow water equations simulating the motion of water in a shallow sea due to tidal forces. Since in such problems the dominant frequencies in the solution are known in advance, the method can take full advantage of the possibility to tune the various parameters to these dominant frequencies. Author (ESA)

N85-20793# Joint Publications Research Service, Arlington, Va.
PRE-TURBULENCE: TRANSITIONAL LAMINAR-TURBULENT FLOWS Abstract Only
A. G. Bershadskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 5-6 Transl. into ENGLISH from Magnitnaya Gidrodinamika (USSR), no. 2, Apr.-Jun. 1984 p 54-60 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20192# Joint Publications Research Service, Arlington, Va.
A MIXED FINITE DIFFERENCE ANALYSIS OF THE INTERNAL AND EXTERNAL TRANSONIC FLOW FIELDS OF INLETS WITH CENTERBODY Abstract Only
Shijun Luo, Huili Shen, Minggang Ji, Zongwen Xing, Songye Dong, and Aiqing Han *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 23 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 25-34 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

N85-20193# Joint Publications Research Service, Arlington, Va.
FINITE DIFFERENCE METHOD FOR SOLVING TURBULENT BOUNDARY LAYER EQUATIONS Abstract Only
Meilin Pan and Zhanqing Liu *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 24 Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, 1984 p 41-49 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

N85-20794# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF FLOW OF OSCILLATORY-RELAXING GAS IN NOZZLES WITH CONSTANT CROSS-SECTIONS IN THROAT REGION Abstract Only
V. A. Salnikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 6 Transl. into ENGLISH from Zh. Prikladnoy Mekhaniki i Tekhnicheskoy Fiz. (USSR), no. 3, May-Jun. 1984 p 61-66 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-20294* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PORTABLE PALLET WEIGHING APPARATUS Patent
Richard M. Day, inventor (to NASA) Issued 30 Oct. 1984 6 p Filed 19 Aug. 1982 Supersedes N83-13425 (21 - 04, p 0521)
(NASA-Case-GSC-12789-1; NAS 1.71:GSC-12789-1; US-Patent-4,479,560; US-Patent-Appl-SN-409680; US-Patent-Class-177-147; US-Patent-Class-177-260; US-Patent-Class-73-862.54) Avail: US Patent and Trademark Office CSCL 14B

An assembly for use with several like units in weighing the mass of a loaded cargo pallet supported by its trunnions has a bridge frame for positioning the assembly on a transportation frame carrying the pallet while straddling one trunnion of the pallet and its trunnion lock, and a cradle assembly for incrementally raising the trunnion. The mass at the trunnion is carried as a static load by a slidable bracket mounted upon the bridge frame for supporting the cradle assembly. The bracket applies the static loading to an electrical load cell symmetrically positioned between the bridge frame and the bracket. The static loading compresses the load cell, causing a slight deformation and a potential difference at load cell terminals which is proportional in amplitude to the mass of the pallet at the trunnion. R.J.F.

N85-20295* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MINIATURE ELECTROOPTICAL AIR FLOW SENSOR Patent
David D. Kershner, inventor (to NASA) Issued 4 Dec. 1984 10 p Filed 14 Apr. 1983 Supersedes N83-25539 (21 - 14, p 2320)
(NASA-Case-LAR-13065-1; NAS 1.71:LAR-13065-1; US-Patent-4,485,671; US-Patent-Appl-SN-484745; US-Patent-Class-73-187) Avail: US Patent and Trademark Office CSCL 14B

A sensor for measuring flow direction and airspeed that is suitable, because of its small size, for rapid instrumentation of research airplanes is described. A propeller driven sphere rotating at a speed proportional to airspeed presents a reflective target to an electro-optical system such that the duty cycle of the resulting electrical output is proportional to yaw angle and the frequency is proportional to airspeed. R.J.F.

N85-20296*# Northeastern Univ., Boston, Mass.
DEVELOPMENT OF A NEW CLASS OF CHEMICAL AND BIOLOGICAL ULTRASENSORS: RIBONUCLEASE CONTAMINATION AND CONTROL Final Report
14 Jun. 1984 4 p Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-956837)
(NASA-CR-175466; JPL-9950-988; NAS 1.26:175466) Avail: NTIS HC A02/MF A01 CSCL 14B

In order to define ribonuclease contamination, an assay for ribonuclease having picogram level sensitivity was established. In this assay, polycytidylic acid is digested by ribonuclease leading to smaller fragments of poly C that remain soluble after treatment of the sample with perchloric acid and lanthanum acetate. An absorbance measurement at 260 nm of the supernatant from the centrifuged sample measures the ribonuclease. A standard curve is shown. Using this assay procedure, ribonuclease contamination was found to be significant in routine laboratory proteins, in particular, bovine serum albumin, lysozyme, catalase, and cytochrome C. This was confirmed by demonstrating a considerable reduction in this activity in the presence of phosphate buffer since phosphate inhibits ribonuclease. Ribonuclease contaminaticn was not significantly encountered in routine laboratory glassware, plasticware, column surfaces, chromatographic particles, and buffer reagents, including airborne contamination. Some contamination could be introduced by fingerprints, however. R.S.F.

N85-20297*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIQUID THICKNESS GAGE Patent Application
Leonard M. Weinstein, inventor (to NASA) Filed 20 Dec. 1984 11 p
(NASA-Case-LAR-13342-1; NAS 1.71:LAR-13342-1; US-Patent-Appl-SN-684186) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus to measure the thickness of liquid independent of liquid conductivity are disclosed. Two pairs of round, corrosion resistant wire are mounted in an insulating material such that the cross-sectional area of each wire is flush with and normal to the surface. The resistance between each pair of wires are measured using two AC resistance measuring circuits. The ratio of the outputs of the two resistance measuring circuits is indicative of the thickness of the liquid on the surface. NASA

N85-20298*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANGULAR MEASUREMENT SYSTEM Patent Application
James R. Currie and Ralph Kissel, inventors (to NASA) Filed 3 Oct. 1984 13 p
(NASA-Case-MFS-25825-1; NAS 1.71:MFS-25825-1; US-Patent-Appl-SN-657309) Avail: NTIS HC A02/MF A01 CSCL 14B

A system for the measurement of shaft angles is disclosed wherein a synchro resolver is sequentially pulsed, and alternately, a sine and then a cosine representive voltage output of it are sampled. Two like type, sine or cosine, succeeding outputs (V sub S1, V sub S2) are averaged and algebraically related to the opposite type output pulse (V sub c) occurring between the averaged pulses to provide a precise indication of the angle of a shaft coupled to the resolver at the instant of the occurrence of the intermediately occurring pulse (V sub c). NASA

N85-20299*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EMITTED VIBRATION MEASUREMENT DEVICE AND METHOD Patent Application
Gary L. Gisler, inventor (to NASA) (Sperry Corp., Phoenix, Ariz.) Filed 3 Oct. 1984 17 p
(NASA-Case-MFS-25981-1; NAS 1.71:MFS-25981-1; US-Patent-Appl-SN-657310) Avail: NTIS HC A02/MF A01 CSCL 14B

This invention is directed to a method and apparatus for measuring emitted vibrational forces produced by a reaction wheel assembly due to imbalances, misalignment, bearing defects and the like. The apparatus includes a low mass carriage supported on a large mass base. The carriage is in the form of an octangonal frame having an opening which is adapted for receiving the reaction wheel assembly supported thereon by means of a mounting ring. The carriage is supported on the base by means of air bearings which support the carriage in a generally frictionless manner when supplied with compressed air from source. A plurality of carriage brackets and a plurality of base blocks provide for physical coupling of the base and carriage. The sensing axes of the load cells are arranged generally parallel to the base and connected between the base and carriage. NASA

N85-20300*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADJUSTABLE INDICATING DEVICE FOR LOAD POSITION Patent Application
Clarence Heller, inventor (to NASA) Filed 20 Dec. 1984 10 p
(NASA-Case-MFS-28008-1; NAS 1.71:MFS-28008-1; US-Patent-Appl-SN-684194) Avail: NTIS HC A02/MF A01 CSCL 14B

An indicating device designed to provide an electrical signal relative to the position of a load is described. The device has a central housing with two wing structures on each side which support conventional switch means having cantilevered arms. Extending through the housing is a movable shaft that is spring biased to a forward extended position and adapted to respond against a load being positioned. The rear end of the movable shaft has an adjustable cam means which acts upon the cantilevered ams to cause a switching action upon shifting of the movable shaft by a load. NASA

N85-20301*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOLID SORBENT AIR SAMPLER Patent Application
Theodore J. Galen, inventor (to NASA) (Northrop Services, Inc., Los Angeles) Filed 10 Oct. 1984 19 p
(NASA-Case-MSC-20653-1; NAS 1.71:MSC-20653-1; US-Patent-Appl-SN-659474) Avail: NTIS HC A02/MF A01 CSCL 14B

A fluid sampler for collecting a plurality of discreet samples over separate time intervals is presented. The sampler comprises a sample assembly with an inlet and a plurality of discreet sample tubes each of which has inlet and outlet sides. A multiport dual acting valve is provided in the sampler to sequentially pass air from the sample inlet into the selected sample tubes. The sample tubes extend longitudinally from the housing and are located at its outer periphery so that upon removal of an enclosure cover, they are readily accessible for analytical operation of the sampler. NASA

N85-20302# Department of the Air Force, Washington, D.C.
EXTRACTING DIGITAL DATA FROM A BUS AND MULTIPLEXING IT WITH A VIDEO SIGNAL Patent Application
D. O. Haque, Jr., inventor (to Air Force) Filed 30 Oct. 1984 71 p
(AD-D011491; US-Patent-Appl-SN-666511) Avail: NTIS HC A04/MF A01 CSCL 14/3

A television video data instrumentation recording system is coupled to a Bus Monitor/Video Encoder to incorporate a digital data recording capability within the normal video signal recording process while allowing for later digital data recovery during video playback. The digital data is acquired from a device addressable serial data bus which is normally an asynchronously polled system for exchanging data messages between a bus master device and multiple slave devices where each slave device has a unique device identification code for its messages. Data acquisition is a passive function (relative to the data bus) involving the hardware programmable selection of messages of interest (based on the message device code) and the software programmable deletion of messages that contain no data of interest. Another feature of data acquisition is that a time-of-acquisition is appended messages of interest. This approach also intercepts the video signal between the television source and the recording system, and programmably assembles the acquired data messages into recording data blocks synchronized to the video signal. GRA

N85-20303# Illinois Univ., Chicago. Dept. of Chemical Engineering.
LASER SCHLIEREN, SHOCK TUBE STUDIES OF HIGH TEMPERATURE HYDROCARBON PYROLYSIS RATES Progress Report, 1 Jun. 1982 - 1 Dec. 1984
J. H. Kiefer Dec. 1984 23 p refs
(Contract DE-AC02-78ER-04759)
(DE85-003314; DOE/ER-04759/6) Avail: NTIS HC A02/MF A01

Progress during the past 2-1/2 years is reflected in the completion of several projects using the laser-schlieren shock-tube technique; the pyrolysis of propane, ethylene, benzene, ethane, and 1,3-butadiene. In addition the new technique of laser flash absorption has been put into full operation and important results on 1.3-butadiene, showing that dissociation must be to two vinyl radicals as originally proposed, have been derived. Laser-schlieren data on toluene and ethylbenzene have also been obtained, and partially analyzed. DOE

N85-20304# Sandia Labs., Livermore, Calif.
EXPERIMENTAL INVESTIGATION OF A PULSE COMBUSTOR: FLOW VISUALIZATION BY SCHLIEREN PHOTOGRAPHY
J. O. Keller, K. Saito (Toshiba Corp., Fuji City, Japan), and K. Kishimoto (Kokushikan Univ., Tokyo) Nov. 1984 19 p refs Presented at the Fall Meeting of the Western States Section of the Combustion Inst., Stanford, Calif., 22-23 Oct. 1984
(Contract DE-AC04-76DR-00789)
(DE85-002862; SAND-84-8928; CONF-8410156-5; WSS/CI-84-56) Avail: NTIS HC A02/MF A01

Pulse combustion devices exhibit exceedingly high thermal efficiency and very low pollutant emission when used in heating applications. The application of these heating devices was limited, however, because of a lack of understanding of the fundamental controlling physical and chemical processes governing pulse combustors. An experimental research program was initiated that uses high-speed schlieren movies, phase-locked schlieren Polaroid still photographs, and OH chemiluminescence as diagnostic tools to understand the fundamental processes governing pulse combustion. The periodic nature of the combustion process is shown in the schlieren records taken of a valved square combustors of the Helmholtz type. The data presented demonstrate the complex nature of this combustion process. The results show that a flame always exists in the combustor, acting as an ignition source for the next cycle. A rapid short-lived combustion process is responsible for the fast pressure rise and, hence, the pulsations. DOE

N85-20305# Sandia Labs., Albuquerque, N. Mex. Measurements Standards and Photography Div.
PRECISION VOLUME MEASURING SYSTEM
P. A. Klevgard Nov. 1984 42 p
(Contract DE-AC04-76DP-00789)
(DE85-002589; SAND-84-8014) Avail: NTIS HC A03/MF A01

An engineering study was undertaken to calibrate and certify a precision volume measurement system that uses the ideal gas law and precise pressure measurements (of low-pressure helium) to ratio a known to an unknown volume. The constant-temperature, computer-controlled system was tested for thermodynamic instabilities, for precision (0.01%), and for bias (0.01%). Ratio scaling was used to optimize the quartz crystal pressure transducer calibration. DOE

N85-20306# Oak Ridge National Lab., Tenn. Fusion Energy Div.
DIRECT READING FAST MICROWAVE INTERFEROMETER FOR EBT
T. Uckan Oct. 1984 16 p refs
(Contract DE-AC05-84OR-21400)
(DE85-000183; ORNL/TM-9240) Avail: NTIS HC A02/MF A01

A simple and inexpensive 4 mm direct reading fast (rise time approx. 100 (MU)s) microwave interferometer is described. The system is particularly useful for density measurements on the ELMO Bumpy Torus (EBT) during pulsed operation. DOE

N85-20307# California Univ., Livermore. Lawrence Livermore Lab.
APPROACHES TO ULTRAFAST NEUTRON DETECTORS
C. L. Wang, R. Kalibjian, M. S. Singh, J. D. Wiedwald, D. B. Campbell, E. M. Campbell, M. D. Cable, W. R. Graves, S. M. Lane, and R. A. Lerche 5 Oct. 1984 9 p refs Presented at the 5th APS Topical Conf. of High Temp. Plasma Diagn., Tahoe City, Calif., 16 Sep. 1984
(Contract W-7405-eng-48)
(DE85-001206; UCRL-91317; CONF-840922-18) Avail: NTIS HC A02/MF A01

Two approaches to obtain detectors of very high temporal resolution are described in the first approach, uranium coated cathode is used in a streak tube configuration. Secondary electrons accompanying the fission fragments from a neutron uranium reaction are accelerated, focused and energy analyzed through a pinhole and streaked. Calculations show that 20 ps time resolution can be obtained. In the second approach, a uranium

coated cathode is integrated into a transmission line. State of the art technology indicates that time resolution of 20 ps can be obtained by gating the cathode with a fast electric pulse. DOE

N85-20308# Sandia Labs., Albuquerque, N. Mex.
PHOTONIC METHODS OF HIGH SPEED ANALOG DATA RECORDING
J. Chang, W. F. Filter, G. J. Lockwood, and B. T. Neyer 1984 33 p refs Presented at 16th Intern. Congr. on High Speed Phot. and Photonics, Strasbourg, 27 Aug. 1984
(Contract DE-AC04-76DP-00789)
(DE84-016723; SAND-84-1738C; CONF-840887-12) Avail: NTIS HC A03/MF A01

A photonic high speed analog data recording system was proposed that, when compared to conventional oscilloscope-based systems, offers economy, higher bandwidth, electrical isolation, and compactness. The basis of this approach is to record photon analog signals rather than electron analog signals. A prototype High Speed Multi-Channel Data Recorder was developed as a key component. Initial applications of this photonic system in pulsed power experiments have already shown its versatility and usefulness. The system, including photonic sensors, is described and its overall impact in diagnostic technology is discussed. DOE

N85-20309# Centro Informazioni Studi Esperienze, Milan (Italy). Fluid Physics Measurement Program.
FLUID TEMPERATURE AND CONCENTRATION GRADIENT MEASUREMENT STUDY Final Report
M. Giglio, S. Musazzi, U. Perini, P. DelVo, A. Ferrario, and A. Figari Paris ESA 4 Jul. 1984 250 p refs
(Contract ESTEC-5417/83/NL-GM)
(CISE-R/FL/1/04; ESA-CR(P)-1938) Avail: NTIS HC A11/MF A01

Instrument concepts for the measurement of temperature and concentration gradients within and at the free surface of low temperature (< 100 C) opaque and transparent fluids were studied. Classical interferometry, optical holography, speckle techniques, optical spectroscopy techniques, photoacoustic and photothermal techniques, ultrasonic techniques, and thermal techniques were considered. Author (ESA)

N85-20310# European Space Agency, Paris (France).
A PROBE FOR DIRECT MEASUREMENT OF FLOW DIRECTION
Raymond Freymann Sep. 1984 32 p refs Transl. into ENGLISH of "Eine Sonde zur direkten Mess. des Richtungsfeldes von Stroemungen', DFVLR, Goettingen, West Ger. Rept. DFVLR-FB-83-37, Nov. 1983 Original language document previously announced as N84-25948
(ESA-TT-853; DFVLR-FB-83-37) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 13,50

A two-hole incidence-angle probe with integrated miniature pressure pickups to determine flow direction was designed. Test procedures used for calibration of the probe are discussed. Results from frequency response tests suggest that this probe is best suited for determination of the flow direction of unsteady air flow. Author (ESA)

N85-20311# National Bureau of Standards, Washington, D.C. ECenter for Electronics and Electrical Engineering.
HIGH-CURRENT MEASUREMENT TECHNIQUES
J. D. Ramboz and D. R. Flach May 1984 23 p refs Sponsored in part by Sandia Labs.
(PB85-100444; NBSIR-84-2881) Avail: NTIS HC A02/MF A01 CSCL 14B

The measurement of very high ac currents presents special problems in the selection of current sensors, instrumentation, and techniques. Initial test results for Rogowski coils and high-capacity current shunts often used to measure large ac currents are discussed. GRA

N85-20312# Bascom-Turner Instruments, Norwood, Mass.
DEVELOPMENT OF A LOW COST ELECTROCHEMICAL CO MONITOR BASED ON STRIPPING VOLTAMMETRY Final Report, Feb. 1983 - May 1984
M. W. Rupich, G. L. Holleck, H. F. Wise, and A. C. Makrides Jun. 1984 95 p refs Sponsored by Gas Research Inst.
(PB85-113470; C-727; GRI-84/0153) Avail: NTIS HC A05/MF A01 CSCL 14B

The quantitative measurement of atmospheric carbon monoxide was demonstrated using an electrochemical method based on stripping voltammetry. The method is based on the selective adsorption of carbon monoxide on the active surface of a platinum sensing electrode followed by its oxidation at more anodic potentials. The technique is applicable to the quantitative measurement of carbon monoxide under a wide range of environmental conditions. Prototype sensors, controlled by inexpensive digital electronic circuitry and microprocessors, were built and tested. The prototype sensors achieved a carbon monoxide detection sensitivity of 100 ppm-min. This detectin method is free of many of the problems associated with traditional carbon monoxide detectors. Author (GRA)

N85-20313# Bureau of Mines, Pittsburgh, Pa.
EFFECT OF WATER VAPOR AND WATER DROPLETS ON THE RAM-1 (REAL-TIME AEROSOL MONITOR): PRELIMINARY RESULTS Investigator Report, 1984
R. P. Vinson, K. L. Williams, G. H. Schnakenberg, Jr., and N. Jayaraman 1984 18 p refs
(PB85-109429; BM-RI-8898; LC-84-600138) Avail: NTIS HC A02/MF A01 CSCL 14B

The effects of high humidity and water droplets on the GCA Corp. real-time aerosol monitor (RAM-1), which uses a 10-mm cyclone preseparator were examined. Tests were conducted both in a laboratory and in a full-scale model mine entry. The laboratory tests were conducted in a test chamber saturated with moisture and water droplets. It is found that the RAM-1 functions acceptably in an atmosphere of water vapor and water droplets similar to the most severe conditions found in an underground mine. GRA

N85-20314# Honeywell, Inc., Bloomington, Minn. Physical Sciences Center.
DEVELOPMENT OF A LOW COST ELECTROCHEMICAL CO MONITOR BASED ON ANODIC SCANNING VOLTAMMETRY IN NONAQUEOUS ELECTROLYTE Final Report, Mar. 1983 - Feb. 1984
H. V. Venkatasetty, D. J. Zook, and J. Forss Aug. 1984 48 p refs
(PB85-113488; GRI-84/0161) Avail: NTIS HC A03/MF A01 CSCL 14B

The feasibility of an electrochemical cell for the detection of carbon monoxide concentration in the range from 10 ppm to 1000 ppm is demonstrated. The cell consists of a nonaqueous electrolyte solution, a sensing electrode, a counter electrode, and a reference electrode with separators and a micro-porous teflon membrane in a sandwich configuration. The cell is interrogated by the technique of anodic scanning voltammetry. Carbon monoxide is oxidized at the sensing electrode at a specific potential generating a characteristic peak current which is proportional to CO concentration. The integrated area under the peak (charge in coulombs) is proportional to the number of oxidized CO molecules. A simple mathematical model based on Langmuir adsorption isotherm was developed to explain the dosimeter type of response by the cell. GRA

N85-20315# California Univ., Berkeley.
NEUTRON STREAK CAMERA ELECTRON GUN DESIGN
E. R. Close and J. S. Colonias Sep. 1984 16 p refs Presented at 5th APS Topical Conf. on High Temp. Plasma Diagn., Tahoe City, Calif., 16 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000620; LBL-18359; CONF-840922-17) Avail: NTIS HC A02/MF A01

Representative values for electrode voltages, time compensa-

tion, and transmission efficiency are obtained by computer simulation for a preliminary design of an electron gun to be used in a neutron steak camera application. The calaculations indicate a time resolution on the order of 20 ps and a transmission efficiency of about 10%. DOE

N85-20316# Los Alamos Scientific Lab., N. Mex.
PIEZOELECTRIC STRESS TRANSDUCER USED FOR MEASUREMENTS OF EXPLOSIONS IN HARD ROCK
L. Junde and L. Cueliang 1984 8 p refs Transl. into ENGLISH from Chengdu Baozha yu Chong Ji, v. 3, 1983 p 73-76
(Contract W-7405-eng-36)
Avail: NTIS HC A02/MF A01

Piezoelectric transducers were considered for measuring the explosion stress waves in hard rocks. The transducers uses to crystal plates which have the good features of high stiffness, high water tightness and simple manufacturing technique, etc., for assembling the structure and the riveting technique. Examples of part of the test results are given. DOE

N85-20317# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
MAGNETIC MEASUREMENTS, CALIBRATIONS, AND STANDARDS: REPORT ON A SURVEY
F. R. Fickett Oct. 1984 25 p
(PB85-127827; NBSIR-84-3018) Avail: NTIS HC A02/MF A01 CSCL 14B

The report summarizes the analysis of responses to a survey of industrial needs for magnetic services and research. GRA

N85-20318# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
GENERALIZED METHOD FOR THE CALIBRATION OF 4-TERMINAL-PAIR TYPE DIGITAL IMPEDANCE METERS
R. M. Judish and R. N. Jones Aug. 1984 60 p refs Sponsored in part by Sandia Labs.
(PB85-128122; NBSIR-84-3016) Avail: NTIS HC A04/MF A01 CSCL 14B

A calibration procedure for digital impedance meters is described and its use is illustrated. The calibration is accomplished through the use of impedance standards which relate instrument readings to the values of the standards through a known functional relationship. The calibration procedure described estimates the parameters associated with the functional relationship and requires the use of a computer. Calibration is accomplished at the reference plane of the impedance standards and any adapter required to connect the standards to the instrument is assumed to be an integral part of the impedance meter. GRA

N85-20319# Environmental Protection Agency, Las Vegas, Nev. Office of Radiation Programs.
AUTOMATED TEM (TRANSVERSE ELECTROMAGNETIC) CELL CALIBRATION SYSTEM
E. D. Mantiply Oct. 1984 124 p refs
(PB85-134377; EPA-520/1-84-024) Avail: NTIS HC A06/MF A01 CSCL 14B

An automated transverse electromagnetic (TEM) cell RF calibration system was considered. The field strength expressions applied, theoretical and experimental determination of modal characteristics of the two cells used, measurements of calibration parameters of system components, a system description, system testing, and sample applications of the automated TEM cell calibration system are all documented. GRA

N85-20201# Joint Publications Research Service, Arlington, Va.
MICRO-DEFORMATION OF QUARTZ UNDER DYNAMIC ACTION AND ITS APPLICATIONS
Lin Zhu and Guangkui Meng *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 43-56 Transl. into ENGLISH from Diqiuhuaxue (China), no. 4, 1982 p 403-411 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

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Includes parametric amplifiers.

N85-20320*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROJECTION LENS SCANNING LASER VELOCIMETER SYSTEM Patent Application
William D. Gunter, Jr. and Anemarie DeYoung, inventors (to NASA) Filed 18 Jan. 1985 13 p
(NASA-Case-ARC-11547-1; NAS 1.71:ARC-11547-1; US-Patent-Appl-SN-692745) Avail: NTIS HC A02/MF A01 CSCL 20E

A laser Doppler velocimeter system is disclosed that has a laser, a waist position adjusting lens, and a beam splitter which direct laser beams parallel to the optical axis of the negative lens. The negative lens is fixed relative to an afocal lens pair. A pair planar mirrors intersect at right angles and respectively intersect the optical axis and the optical axis of the afocal lens pair. Mirrors are movable along the optical axis toward and away from the afocal lens pair to focus the laser beams in focus area while maintaining a constant beam waist, crossing angle, and intersection with other laser beams. This produces a constant sensitive volume as the focus is changed. NASA

N85-20321# California Univ., Livermore. Lawrence Livermore Lab.
MODAL TESTING AND ANALYSIS OF NOVA LASER STRUCTURES
R. Bradley Burdick, H. Joseph Weaver, and John W. Pastrnak Sep. 1984 6 p refs Presented at the 3rd Intern. Modal Analysis Conf., Orlando, Fla., 28-31 Jan. 1985
(Contract W-7405-eng-48)
(DE84-017569; UCRL-90848; CONF-850118-4) Avail: NTIS HC A02/MF A01

NOVA, currently the world's most powerful laser system, is an ongoing project at the Lawrence Livermore National Laboratory in California. The project seeks to develop a feasible method or achieving controlled fusion reaction, initiated by multiple laser beams targeted on a tiny fuel pellet. The NOVA system consists of several large steel framed structures, the largest of which is the target chamber tower. In conjunction with design engineers, the tower was first modelled and analyzed by sophisticated finite element techniques. A modal test was then conducted on the tower structure to evaluate its vibrational characteristics and seismic integrity as well as for general comparison to the finite element results. The procedure used in the experimental modal analysis and the results obtained from that test are discussed. DOE

N85-20322# Brookhaven National Lab., Upton, N. Y. Physics Dept.
LASER-ELECTRON-GAMMA-SOURCE (LEGS) Progress Report, Jun. 1984
D. H. Dowell, G. Giordano, M. J. LeVine, G. Matone, A. M. Sandorfi, C. Schaerf, C. E. Thorn, and W. Ziegler 1984 7 p ref Presented at the Gordon Conf., Tilton, N.H., 9 Jul. 1984
(Contract DE-AC02-76CH-00016)
(DE85-003204; BNL-34938; CONF-8407104-2) Avail: NTIS HC A02/MF A01

Construction of the Laser Electron Gamma Source (LEGS) began at Brookhaven in October 1983. When completed, the source will provide intense beams of monochromatic and polarized gamma rays with energies in the range of several hundreds of MeV. The planned layout of this facility with its experimental areas is shown. The gamma-ray beams will be produced by Compton backscattering UV laser light from the electrons circulating in the 2.5-3.0 GeV X-ray storage ring of the National Synchrotron Light Source (NSLS) at BNL. The X-ray ring is currently running with 50 mA at 1.7 GeV, and is expected to reach 2.5 GeV by November 1984. There is as yet no firm schedule for operation at 3.0 GeV, although some initial testing should be completed by the end of

1986. The availability of the 210-420 MeV LEGS beam will depend upon these 3 GeV studies. DOE

N85-20323# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Electrical and Computer Engineering.
ELECTRON ACCELERATION BY LASER FIELDS IN A GAS Progress Report, 1 Jan. - 30 Sep. 1984
Jorge Fontana 1984 39 p refs
(Contract DE-AT03-84ER-40136)
(DE85-000575; DOE/ER-40136/T2) Avail: NTIS HC A03/MF A01

Two particular topics were investigated, electron passes through Gaussian laser beams, and electron beam behavior in a scattering gas under laser field forces. A general description of each is given. DOE

N85-20324# Sandia Labs., Albuquerque, N. Mex.
CHEMICALLY AMPLIFIED LASER DIRECT-WRITING OF ALUMINUM
J. Y. Tsao and D. J. Ehrlich (Lincoln Lab., Lexington, Mass.) 1984 3 p refs Presented at Symp. on the Sci. Basis for Nucl. Waste Manage., Boston, 26 Nov. 1984 Sponsored in part by DARPA
(Contract DE-AC04-76DP-00789)
(DE85-000308; SAND-84-1949C; CONF-841157-12) Avail: NTIS HC A02/MF A01

Laser microchemical direct writing has important advantages over other techniques for the deposition of thin-film patterns. Disadvantages, however, are lower throughput and the need to suppress competing processes such as gas phase nucleation of particles or substrate damage. Methods for increasing the overall speed of laser direct writing by microchemistry were investigated. A class of laser deposition techniques has emerged in which laser radiation is used only to enhance or to impede the initial nucleation of a thin film. In general, it is convenient to draw a distinction between nucleation barriers due to physical effects and those due to chemical effects. The first type of barrier is derived from surface tension. The laser deposits a pattern of heterogeneous catalyst to initiate a subsequent transformation that is chemically self-sustaining or autocatalytic. Experiments, in which the laser direct writing of patterned thin films of Al is chemically amplified by subsequent selective pyrolytic chemical vapor deposition are summarized. DOE

N85-20325# KMS Fusion, Inc., Ann Arbor, Mich.
KMSF X-RAY LASER EXPERIMENTS, TASK NO. 1 Final Report
G. Charatis 1984 10 p
(Contract W-7405-eng-48)
(DE85-001002; UCRL-15630-1) Avail: NTIS HC A02/MF A01

The laser target experiments that were performed are listed as well as the major conclusions. Topics covered include: resonant photoexcitation, electron collisional excitation, and collisional recombination. DOE

N85-20326# Los Alamos Scientific Lab., N. Mex.
PROGRESS TOWARD FREE-ELECTRON LASERS FOR APPLICATIONS
Charles A. Brau 1984 13 p Presented at the 8th Conf. on the Application of Accelerators in Res. and Industry, Denton, Tex., 12-14 Nov. 1984
(Contract W-7405-eng-36)
(DE85-002208; LA-UR-84-3149; CONF-841117-14) Avail: NTIS HC A02/MF A01

Using an electron beam in a magnetic field as the gain medium, free-electron lasers offer a powerful new source of tunable, coherent radiation. Results are just becoming available from several new experiments, but they are confirming the theoretical promise of these devices. Backed up by a strong base of accelerator technology, free-electron lasers are expected to become important in applications requiring wavelengths from the far infrared part of the spectrum to the vacuum ultraviolet. DOE

N85-20327# California Univ., Livermore. Lawrence Livermore Lab.
OPTICAL GUIDING IN A FREE ELECTRON LASER
E. T. Scharlemann, A. M. Sessler, and J. S. Wurtele 16 Oct. 1984 26 p Presented at Workshop on Coherent and Collective Properties of Relativistic E-Beams and Electromagnetic Radiation, Villa Olma, Italy, 13 Sep. 1984
(Contract W-7405-eng-48)
(DE85-003141; UCRL-91476; CONF-8409163-2) Avail: NTIS HC A03/MF A01

The coherent interaction between an optical wave and an electron beam in a free electron laser (FEL) is shown to be capable of optically guiding the light. The effect is analyzed using a two dimensional approximation for the FEL equations, and using the properties of optical fibers. Results of two dimensional (cylindrically symmetric) numerical simulations are presented, and found to agree reasonably well with the analytically derived criterion for guiding. Under proper conditions, the effect can be large and has important applications to short wavelength FELs and to directing intense light. DOE

N85-20328# Martin Marietta Energy Systems, Inc., Oak Ridge, Tenn.
APPLICATIONS OF PULSED-LASER TECHNIQUES AND THERMOGRAPHIC PHOSPHORS TO DYNAMIC THERMOMETRY OF ROTATING SURFACES
M. R. Cates, S. W. Allison, B. R. Marshall (Edgerton, Grier and Germeshausen, Inc., Santa Barbara, Calif.), L. A. Franks (Edgerton, Grier and Germeshausen, Inc., Santa Barbara, Calif.), T. J. Davies (Edgerton, Grier and Germeshausen, Inc., Santa Barbara, Calif.), M. A. Nelson (Edgerton, Grier and Germeshausen, Inc., Santa Barbara, Calif.), and B. W. Noel (LASL) 1984 8 p refs Presented at the Intern. Conf. on Appl. Lasers and Elec. Optics, Boston, 12 Nov. 1984
(Contract DE-AC05-84OT-21400)
(DE85-000403; K/TS-11-504; CONF-8411100-2) Avail: NTIS HC A02/MF A01

Stimulating fluorescence by synchronous application of pulsed uv laser light was used to measure surface temperatures of rotating objects. The temperature dependence of the lifetime of selected emission lines from a phosphor bonded to the surface provides temperature resolution, in the room temperature range, of about 0.3 C. The experimental technique includes fiber optics transfer of stimulating and signal light, timing circuitry, photomultiplier electronics, and waveform processing. DOE

N85-20329# California Univ., Livermore. Lawrence Livermore Lab.
POTENTIAL OF HIGH-AVERAGE-POWER SOLID STATE LASERS
J. L. Emmett, W. F. Krupke, and W. R. Sooy 25 Sep. 1984 53 p refs
(Contract W-7405-eng-48)
(DE85-003884; UCRL-53571) Avail: NTIS HC A04/MF A01

The possibility of extending solid state laser technology to high average power and of improving the efficiency of such lasers sufficiently to make them reasonable candidates for a number of demanding applications is discussed. The core idea is configuring the laser medium in relatively thin, large-area plates, rather than using the traditional low-aspect-ratio rods blocks. This presents a large surface area for cooling, and assures that deposited heat is relatively close to a cooled surface. It also minimizes the laser volume distorted by edge effects. Two types of lasers can, in principle, utilize this sheet-like gain configuration in such a way that phase and gain profiles are uniformly sampled and, to first order, yield high-quality (undistorted) beams. The zig-zag laser does this with a single plate, and should be capable of power levels up to several kilowatts. The disk laser is designed around a large number of plates, and should be capable of scaling to arbitrarily high power levels. DOE

N85-20330# Argonne National Lab., Ill.
USE OF LASER FLOW VISUALIZATION TECHNIQUES IN

REACTOR COMPONENT THERMAL-HYDRAULIC STUDIES
J. J. Oras and K. E. Kasza 1984 4 p refs Presented at Joint Meeting of the Am. Nucl. Soc. and the Atomic Ind. Forum, Washington, D.C., 11 Nov. 1984
(Contract W-31-109-eng-38)
(DE84-014768; CONF-841105-5) Avail: NTIS HC A02/MF A01

To properly design reactor components, an understanding of the various thermal hydraulic phenomena, i.e., thermal stratification flow channeling, recirculation regions, shear layers, etc., is necessary. In the liquid metal breeder reactor program, water is commonly used to replace sodium in experimental testing to facilitate the investigations, (i.e., reduce cost and allow fluid velocity measurement of flow pattern study). After water testing, limited sodium tests can be conducted to validate the extrapolation of the water results to sodium. A novel laser flow visualization technique being utilized at ANL is described together with various examples of its use and plans for further development. A 3-watt argon-ion laser, in conjunction with a cylindrical opticallens, was used to create a thin (approx. 1-mm) intense plane of laser light for the illuminiation of various flow tracers in precisely defined regions of interest within a test article having windows. DOE

N85-20331# California Univ., Livermore. Lawrence Livermore Lab.
MEASUREMENT OF HOT-ELECTRON PRODUCTION AND MICROWAVE EMISSION BY LASER-IRRADIATED CH TARGETS
J. E. Heidrich, S. K. Ault, H. A. Koehler, S. M. Pollaine, V. W. Slivinsky, R. A. Zacharias, and J. D. Kilkenny (Imperial Coll. of Science and Technology) Oct. 1984 35 p refs Presented at the Meeting of the Plasma Physics Division of the American Physical Society, Boston, 27 Oct. 1984
(Contract W-7405-eng-48)
(DE85-003139; UCRL-91174; CONF-841010-9) Avail: NTIS HC A03/MF A01

An experimental study was conducted on hot-electron production and microwave emission by laser irradiated targets. The laser was a neodymium glass laser (1.06-micron wavelength). Typically the laser beam consisted of a weak 3 mJ repulse followed by a strong 30 J main pulse 8ns later. Both pulses had a temporal duration of 150 psec and were focused to a 30-micron diameter pot. The majority of the data presented were obtained using exploding-foil-type targets, which had either copper or tin foils attached to the side pointed away from the laser. These foils emitted X-rays that were used to diagnose hot electron temperature, energy and transport. Other targets used were plastic, brass, and copper disks. Specific goals of the experiment included: measurement of the hot-electron temperature and energy, determination of how the hot electrons spread from the point of their generation, and measure of the microwave energy spectrum and total energy emitted from the targets. DOE

N85-20332# Pacific Northwest Lab., Richland, Wash.
TIME RESOLVED RAMAN STUDIES OF LASER INDUCED DAMAGE IN TiO2 OPTICAL COATINGS
G. J. Exarhos and P. I. Morse (AFWL) Oct. 1984 24 p refs Presented at the Symp. on Optical Mater. for High Power Lasers, Boulder, Colo., 15 Oct. 1984
(Contract DE-AC06-76RL-01830)
(DE85-003166; PNL-SA-12573; CONF-8410186-2) Avail: NTIS HC A02/MF A01

Molecular information available from Raman scattering measurements of sputter deposited TiO2 on silica substrates were used to characterize crystalline phases, thickness, and surface homogeneity. A two laser technique is described for investigating transient molecular changes in both coating and substrate which result from pulsed 532 nm laser irradiation. Single layer and multilayer coatings of both anatase and rutile phases of TiO2 have been probed by Raman spectroscopy immediately following the damage pulse (nanoseconds) and at longer times. Transient measurements are designed to follow surface transformation/relaxation phenomena; measurements at longer times characterize the equilibrium damage state. DOE

N85-20333# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
OPTICAL SECOND HARMONIC GENERATION FOR SURFACE STUDIES
Y. R. Shen Aug. 1984 14 p refs Presented at the 1st Intern. Conf. on the Struct. of Surfaces (ICSOS), Berkeley, Calif., 13-16 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000670; LBL-18192; CONF-840821-5) Avail: NTIS HC A02/MF A01

Surface second harmonic generation (SHG), using laser pulses, is shown to be an effective tool for studying surfaces. Observations on Rh surfaces with adsorbed O2, CO, and Na, and on Si during oxidation are reported. DOE

N85-20334# Rochester Univ., N. Y. Lab. for Laser Energetics.
OPERATIONAL CHARACTERISTICS OF THE OMEGA SHORT-WAVELENGTH LASER FUSION FACILITY
J. M. Soures, R. Hutchison, S. Jacobs, R. L. McCrory, R. Peck, and W. Seka 1984 15 p Presented at the Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Boston, 27 Oct. 1984
(Contract DE-AC08-80DP-40124)
(DE85-002819; DOE/DP-40124/60; CONF-841010-2) Avail: NTIS HC A02/MF A01

Twelve beams of the OMEGA, 24 beam direct-drive laser facility were converted to 351-nm wavelength operation. The performance characteristics of this short-wavelength facility will be discussed. Beam-to-beam energy balance of + or - 2.3% and on-target energy, at 351 nm, in excess of 70 J per beam were demonstrated. Long-term performance (> 600 shots) of the system was optimized by appropriate choice of index matching liquid, optical materials and coatings. The application of this system in direct-drive laser fusion experiments will be discussed. DOE

N85-20335# KMS Fusion, Inc., Ann Arbor, Mich.
KMSF X-RAY LASER EXPERIMENTS, TASK NO. 2 Final Report
George Charatis Jul. 1984 8 p
(Contract W-7405-eng-48)
(DE85-000291; UCRL-15630-2) Avail: NTIS HC A02/MF A01

This report summarizes work done at KMS Fusion, Inc., in support of the X-ray laser experimental program at Lawrence Livermore National Laboratory. Two major investigations concerned with resonant photoexcitation are described. An interferometric re-examination of the density profiles vs time with changes in the design of double-foil target changes on the spectroscopy of the resonant photoexcitation scheme is also examined. DOE

N85-20336# European Space Agency, Paris (France).
MODEL CALCULATIONS FOR A CO2 MIXING LASER WITH SCREEN NOZZLE
Wolfgang Schall and Helmut Huegel Nov. 1984 149 p refs Transl. into ENGLISH of "Modellrechnungenzum CO2-mischungslaser mit Siebduese', DFVLR, Stuttgart Rept. DFVLR-FB-83-41, Dec. 1984 Original language document previously announced as N84-25039
(ESA-TT-859; DFVLR-FB-83-41) Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 40,50

A semiempirical, one dimensional model for a gasdynamic CO2 laser with screen mixing nozzle is presented. The calculation of profiles of small signal gain, available energy, and bounds for the laser power along the flow direction was based on the assumption of a finite mixing length. The calculated distributions were compared with experimental results and allow for their physical interpretation. Proposals for improving an existing laser are presented. Upper limits to the power of this device and for screen nozzle mixing lasers in general were determined based upon physically and technically realistic initial conditions. Author (ESA)

N85-20217# Joint Publications Research Service, Arlington, Va.
A FREE ELECTRON LASER WITH TWO-COMPONENT WIGGLER Abstract Only

Shizhan Lei *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 145 Transl. into ENGLISH from Hongwai Yanjiu (China), v. 3, no. 3, 1984 p 184-188 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20796# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION OF WAVEFRONT CONJUGATION DURING MANDELSTAM-BRILLOUIN SCATTERING OF FOCUSED LASER BEAMS IN CONDENSED MEDIA Abstract Only
P. Y. Balkyavichyus, A. S. Dementyev, Y. P. Lukoshyus, E. K. Maldutis, and V. P. Tarulis *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 7 Transl. into ENGLISH from Litovskiy Fizicheskiy Sbornik (USSR), V. 24, no. 2, Mar.-Apr. 1984 p 81-89 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20797# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMPURITIES ON ABSORPTION IN SEMICONDUCTORS AND LASING OF SEMICONDUCTOR LASERS Abstract Only
V. F. Yelesin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 7 Transl. into ENGLISH from Zh. Eksperimentalnoy i Teoreticheskoy Fiz. (USSR), v. 87, no. 1, Jul. 1984 p 135-142 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20800# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF UNSTABLE RESONATORS IN FLASH-LAMP-PUMPED ORGANIC-COMPOUND LASERS Abstract Only
V. A. Alekseyev, B. F. Trinchuk, and A. V. Shulenin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 9 Transl. into ENGLISH from Zh. Prikladnoy Spektroskoppi (USSR), v. 61, no. 1, Jul. 1984 p 28-33 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20801# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF STRUCTURE OF THIOPYRILOCYANIC DYES ON OUTPUT CHARACTERISTICS OF PASSIVE MODE-LOCKED LASER Abstract Only
M. I. Demchuk, V. P. Mikhaylov, A. A. Ishchenko, M. A. Kudinova, A. I. Tolmachev, and K. V. Yumashev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 9 Transl. into ENGLISH from Zh. Prikladnoy Spektroskopii (USSR), v. 61, no. 1, Jul. 1984 p 21-28 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20802# Joint Publications Research Service, Arlington, Va.
LASING CHARACERTISTICS OF YAG: Nd(3+)-LASER WITH LiF PASSIVE SHUTTER WITH F2 COLOR CENTERS Abstract Only
S. G. Grafenshteyn, N. A. Ivanov, D. V. Inshakov, I. A. Partianovich, A. A. Fomichev, V. A. Chepurnoy, and M. A. Yakshin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 10 Transl. into ENGLISH from Pisma v Zh. Tekhnicheskoy Fiziki (USSR), v. 10, no. 14, 26 Jul. 1984 p 847-850 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20803# Joint Publications Research Service, Arlington, Va.
DISTORTION OF TEMPORAL CHARACTERISTICS DURING PARAMETRIC UP-CONVERSION OF ULTRASHORT LASER PULSES Abstract Only
G. M. Gandelman, O. Yu. Itskovich, P. S. Kondratenko, S. S. Sobolev, B. M. Stepanov, and S. F. Chalkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 10 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1348-1352 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20804# Joint Publications Research Service, Arlington, Va.
STABILITY OF TEMPORAL AND ENERGY PARAMETERS OF PICOSECOND LANTHANUM BERYLLATE LASER Abstract Only
A. Piskarskas, V. Sirutkaytis, A. Yuozapavichyus, and A. Yankauskas *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 11 Transl. into ENGLISH from Kvantovaya Eiektronika (USSR), v. 11, no. 7, Jul. 1984 p 1487-1490 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20805# Joint Publications Research Service, Arlington, Va.
AUTOSTOCHASTIC BEHAVIOR OF SOLID STATE RING LASER WITH LOW FREQUENCY PERIODIC LOSS MODULATION Abstract Only
P. A. Khandokhin and Ya. I. Khanin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 11 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1483-1487 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20806# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF DYE LASERS PUMPED BY HIGH-POWER KrF LASER RADIATION Abstract Only
A. D. Klementov, N. V. Morozov, and P. B. Sergeyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 12 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1389-1393 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20807# Joint Publications Research Service, Arlington, Va.
SATURATION KINETICS OF ACTIVE MEDIUM OF OXYGEN-IODINE LASER Abstract Only
M. V. Zagidullin, V. I. Igoshin, and N. L. Kupriyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 12 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1379-1389 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20808# Joint Publications Research Service, Arlington, Va.
ABSORPTION OF OZONE MOLECULES IN STRONG FIELD OF TEA CO2 INJECTION LASER Abstract Only
M. S. Dzhidzhoyev, V. K. Popov, V. T. Platonenko, and A. V. Chugunov *In its* USSR Rpet.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 13 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1357-1363 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-20337* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LINEAR MAGNETIC BEARINGS Patent
Michael P. Goldowskiy (North American Philips Co., Inc., Briarcliff Manor, N.Y.) Issued 25 Sep. 1984 12 p Filed 8 Sep. 1982 Supersedes N83-13460 (21 - 04, p 0526) Continuation-in-part of abandoned US Patent Appl. SN-220213, filed 24 Dec. 1980 Sponsored by NASA
(NASA-Case-GSC-12582-2; NAS 1.71:GSC-12582-2; US-Patent-4,473,259; US-Patent-Appl-SN-415960; US-Patent-Appl-SN-220213; US-Patent-Class-308-10; US-Patent-Class-104-281; US-Patent-Class-104-284) Avail: US Patent and Trademark Office CSCL 13I

A self regulating, nonfrictional, active magnetic bearing is disclosed which has an elongated cylindrical housing for containing

a shaft type armature with quadrature positioned shaft position sensors and equidistantly positioned electromagnets located at one end of the housing. Each set of sensors is responsive to orthogonal displacement of the armature and is used to generate control signals to energize the electromagnets to center the armature. A bumper magnet assembly is located at one end of the housing for dampening any undesired axial movement of the armature or to axially move the armature either continuously or fixedly. Official Gazette of the U.S. Patent and Trademark Office

N85-20338* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SLOW OPENING VALVE Patent
Donald F. Drapeau, inventor (to NASA) (Hamilton Standard, Windsor Locks, Conn.) Issued 20 Nov. 1984 6 p Filed 25 Jun. 1982 Supersedes N82-28641 (20 - 19, p 2693) Sponsored by NASA
(NASA-Case-MSC-20112-1; NAS 1.71:MSC-20112-1; US-Patent-4,483,512; US-Patent-Appl-SN-392104; US-Patent-Class-251-265; US-Patent-Class-251-267; US-Patent-Class-251-284; US-Patent-Class-251-297; US-Patent-Class-74-424.8B; US-Patent-Class-74-424.8VA) Avail: US Patent and Trademark Office CSCL 13K

A valve control is described having a valve body with an actuator stem and a rotating handle connected to the actuator stem by a differential drive mechanism which, during uniform movement of the handle in one direction, initially opens the valve at a relatively slow rate and, thereafter, complete the valve movement at a substantially faster rate. A series of stop rings are received about the body in frictional abutting relationship and serially rotated by the handle to uniformly resist handle movement independently of the extent of handle movement.
Official Gazette of the U.S. Patent and Trademark Office

N85-20339*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATIONS OF TETHERS IN SPACE, VOLUME 1
Alfred C. Cron, comp. (General Research Corp., McLean, Va.) Washington Mar. 1985 283 p refs Workshop held in Williamsburg, Va., 15-17 Jun. 1983 2 Vol.
(Contract NAS8-35403)
(NASA-CP-2364; M-475; NAS 1.55:2364) Avail: NTIS HC A13/MF A01 CSCL 13I

The tethered satellite system is described including tether fundamentals. Applications of very long tethers in space to a broad spectrum of future space missions are explored. Topics covered include: science, transportation, constellations, artificial gravity, technology and test, and electrodynamic interactions. Recommendations to NASA are included. For individual titles, see N85-20340 through N85-20360.

N85-20340*# National Aeronautics and Space Administration, Washington, D. C.
TETHERS OPEN NEW SPACE OPTIONS
Ivan Bekey *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 14 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 13I

The fundamentals of tether action are discussed with focus on the forces acting on tethered masses and a tethered satellite system being developed for deployment from the space shuttle is examined. The static, dynamic, and electric properties of the tether can be exploited for use in the long term observation of phenomena of the lower troposphere; as a space based wind tunnel; to generate high electrodynamic power; to provide desirable gravity for the space station; to dock orbit transfer vehicles with the space station; and to form a constellation of space platforms tied to the space station. Italy is responsible for building and integrating the satellite. NASA is involved in building the deployer and integrating the tethered satellite system with the space shuttle. A.R.H.

N85-20341*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TETHERED SATELLITE SYSTEM PROJECT OVERVIEW
Jay H. Laue *In its* Appl. of Tethers in Space, Vol. 1 Mar. 1985 16 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 13I

The Skyhook concept is reviewed and the use of a tethered satellite system (TSS) to enable scientific investigations from the shuttle using a closed loop control system is examined. The tethered satellite system has capabilities for deployment toward or away from Earth, for multiple round trip missions, and for deployment at distances up to 100 KN from the orbiter. The deployer, which consists of an entendable boom, a reel for the tether, and the tether itself, permits deployment and retrieval at a safe distance, allows alignment of the force vector of the tether through the center of gravity of the shuttle, and gives some initial gravity gradient separation to aid in deployment and ultimate retrieval of the tethered satellite. Charts show TSS activities in terms of systems studies, key guidelines, Italian and U.S. responsibilities, user activities, and major science and applications accommodation features. Scientific objectives for TSS-1 and TSS-2 verification missions and the current status of the project are also given. A.R.H.

N85-20342*# Martin Marietta Corp., Denver, Colo.
SHUTTLE TETHERED SATELLITE SYSTEM PROGRAM OVERVIEW
Donald Crouch *In* NASA. Marshall Space Flight Center Appl. of tethers in Space, Vol. 1 Mar. 1985 13 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 13I

The first of two demonstration flights of the tethered satellite system (TSS) is planned for the STS-52 flight and is designed to study tether electromagnetic interaction. The magnetospheric-ionospheric-atmospheric coupling processes in the lower troposphere are to be directly measured on the second TSS mission. An operational overview of the TSS-to-orbiter-to-ground interface is given and the TSS deployment concept is explained. Other aspects discussed include the tethered satellite-to-orbiter interface; tether control mechanisms; tether materials, and electrical interfaces. The design of the demonstration flight satellite and its instruments is described. The capabilities of the TSS for the demonstration flight are listed. A.R.H.

N85-20343*# Consiglio Nazionale delle Ricerche, Rome (Italy).
TSS SATELLITE OVERVIEW
Gianfranco Manarini *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 21 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A02/MF A01 CSCL 13I

The responsibilities of NASA and PSN/CNR in the tethered satellite system cooperative program are listed and PSN/CNR-AIT system support and technologies studies are summarized. Results are given for investigations of active vs. passive satellite trade offs; analysis of alternative maneuvers; satellite attitude and position determination analysis failure modes analysis; moveable boom dynamic analysis; double tethered satellite system; and thermo/dynamic analysis for 100 km to 120 km altitude range. Objectives for the space plasma science mission and its applications are outlined and the TSS satellite configuration is highlighted. Programmatic aspects are included. A.R.H.

N85-20344*# Aeritalia S.p.A., Naples (Italy).
SATELLITE MODULE DESIGN c15
Marcello Vignoli *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 19 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A02/MF A01 CSCL 22B

The tethered satellite system (TSS) satellite is a multimission vehicle able to carry scientific payloads aways from the shuttle orbiter in the range of 130 to 330 km in altitude. The multimission capability is obtained adopting a modular concept of the satellite such to allow for: easy reconfiguration, easy refurbishment, and cost and schedule minimization. The modular concept is realized with: a payload module (PM), a service module (SM), and an

auxiliary propulsion module (APM). The satellite configuration for the electrodynamic and atmospheric missions is described as well as its mechanized capabilities. Payload dedicated electrical facilities, satellite position determination accuracy; attitude control and measurement accuracy and attitude oscillation characteristics are summarized. A.R.H.

N85-20345*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TETHER FUNDAMENTALS
Charles Rupp *In its* Appl. of Tethers in Space, Vol. 1 Mar. 1985 15 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 13I

Forces on tethered satellites, tether tension as a function of the effective mass, and parameters of candidate tether materials are examined. Illustrations show: stabilization control law; tethered satellite deployment and retrieval; angular momentum; electric motor effect reboost; a very long tether phenomenon; shuttle tethered satellite effects on the orbiter; artificial gravity; tethered satellite rendezvous docking relative velocity; and scaling up from the shuttle/TSS. Limitations of the tethered satellite system and of tether properties as well as cost/benefits trades for future applications are considered. A.R.H.

N85-20346*# Rome Univ. (Italy).
SCIENCE APPLICATIONS, PART 1 **c12**
Franco Mariani *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p refs (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

The tethered satellite system mission can allow direct observation of the structure and the dynamics of the lower atmosphere; as well as answer some basic questions on the chemical composition of the atmosphere; the coupling mechanisms between small and large scale motions; the global wind field of the lower atmosphere, and how it is influenced by waves and tides; the mass, momentum, and energy fluxes in the lower thermosphere; how the above are affected by externally perturbed conditions (for example by magnetic storms, solar wind and its variability, etc.); and the pattern of electric current circulation and its relationship with the magnetospheric environment. Fundamental plasma processes can also be studied. Similarity of conditions in other plasmas in space makes it possible to get information on the magnetospheres of the giant planets or more generally on the solar system. The electrodynamic phenomena associated with the Jovian satellite Io (radioemission, UV emission, energetic electron precipitation) can be examined by simple scaling to the terrestrial case. A.R.H.

N85-20347*# National Aeronautics and Space Administration, Washington, D. C.
SCIENCE APPLICATIONS, PART 2 **c12**
James P. Murphy *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 18 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

The goals of the Geopotential Research Program are to contribute to the understanding of the solid earth; the origin and evolution of the earth; its internal structure and the dynamics of the core and the mantle; the movements and deformations of the tectonic plates that make up the surface of the earth; its rotational dynamics; the changes in the rotation rate of the earth; the orientation of the pole in space; variations of the gravity and magnetic field of the earth; the origin of the earth and the way in which the solid earth interacts with the oceans and the atmosphere. Author

N85-20348*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTRODYNAMIC INTERACTIONS **c15**
Nobie H. Stone *In its* Appl. of Tethers in Space, Vol. 1 Mar. 1985 17 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22B

It is apparent that the electrodynamic tether offers new potential for unique scientific experiments which should enhance the understanding of space plasma physics and in particular certain classes of solar system plasma phenomena, and that these science studies will also address a number of key engineering concerns which may open up new power and thrust generation technology that could be a significant factor in future space operations. Author

N85-20349*# California Univ., San Diego, La Jolla.
TRANSPORTATION APPLICATIONS, PART 1 **c12**
Joseph Carroll *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 27 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

The applications of tethers in support of space transportation is divided into: (1) orbit transfer, momentum transfer release/rendezvous (hanging, swinging, and spinning) and simplified docking; (2) orbit maintenance: electrodynamic thrust in or out of plane, electrodynamic libration pumping or damping, momentum scavenging, and isolate thruster exhaust; and (3) transfer within constellation: deployment or retrieval of whole constellation, clothesline loop, hoist, tram for travel on the tether, monkey between the tethers, and power and fluid transfer. B.G.

N85-20350*# Aeritalia S.p.A., Rome (Italy).
TRANSPORTATION APPLICATIONS, PART 2 **c12**
Enrico Lorenzini *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 14 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

The capabilities of a tethered teleoperator are discussed, including payload transfer reentry, rendezvous and docking, and deployment and retrieval of the tether teleoperator maneuvering system (TTMS). The expected advantages of the TTMS in the areas of payload transfer, rendezvous, docking, and reentry are outlined. The applicability of the TTMS concept to NASA space stations is examined. R.S.F.

N85-20351*# National Aeronautics and Space Administration, Washington, D. C.
PHYSIOLOGICAL CONSIDERATIONS OF ARTIFICIAL GRAVITY **c52**
D. Bryant Cramer *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 13 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 06S

Reasons for the development of artificial gravity environments on spacecraft are outlined. The physiological effects of weightlessness on the human cardiovascular skeletal, and vestibular systems are enumerated. Design options for creating artificial gravity environments are shown. R.S.F.

N85-20352*# California Univ., San Diego, La Jolla.
CONSTELLATIONS **c15**
David R. Criswell *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 13 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22B

Multiple spacecraft configurations which involve tethering are presented. Potential applications of such tethered systems are enumerated. Tethers are thought to provide a way to open up the utility of large masses in orbit, perhaps allowing for the reoptimization of the STS toward greater total mass and volume per launch. Significant materials reserves could also be held in orbit. R.S.F.

N85-20353*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TECHNOLOGY AND TEST
Paul Siemers *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 5 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 13I

The status of tether-related technology is discussed together with the program that should be initiated to develop the technology required by the tethered satellite system. Successful tethering during the Gemini program is mentioned. Technology areas which appear to have application to tethered systems are identified, including electrodynamics, atmospherics, and aerothermodynamics. R.S.F.

N85-20354*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
WHERE ARE WE GOING IN TETHERS
Guiseppe Colombo *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 6 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 13I

The state of the art of the tether in space science and in space operations is discussed. It is emphasized that space technology is not the continuation of aerodynamics, but rather is something fundamentally distinct. The tether is foreseen as a basic structural element for aerospace engineering in the future. R.S.F.

N85-20355*# National Aeronautics and Space Administration, Washington, D. C.
SUMMARY PRESENTATION OF THE SCIENCE APPLICATIONS PANEL c12
Robert Hudson *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 7 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

The advantages of tethering several satellites are discussed. Future science TSS applications are enumerated, including planetary missions that involve getting payloads as close to a planetary surface as possible. Areas of scientific interest relating to tethered systems are listed: geodynamics, aeronomy, electrodynamics, and Earth observations. R.S.F.

N85-20356*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUMMARY PRESENTATION OF THE ELECTRODYNAMICS INTERACTIONS PANEL c32
Nobie H. Stone *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 12 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 20N

Technological and scientific uses of electrodynamic tethers in space are considered. Areas of concern for such applications of electrodynamic tethers are enumerated. Thrust and power generation using tethers are discussed. R.S.F.

N85-20357*# Lockheed Corp., Burbank, Calif.
SUMMARY PRESENTATION OF THE TRANSPORTATION PANEL c12
Maxwell W. Hunter *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 15 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

Space mission scenarios are presented in which tethering is utilized. The technical and cost benefits are considered along with practicality and operational requirements. The mission scenarios considered include: (1) space shuttle delivery of payloads to higher orbits; (2) the downward release of the external tank from a shuttle; (3) space station altitude reboost using shuttle angular momentum; (4) shuttle docking to space station tether; (5) using shuttle based tether to assist launch of upper stage to higher energy orbits; (6) using space station tether to deploy payloads to higher orbits with momentum accumulator; (7) using tethers to discard first stages or apogee motors; and (8) planetary applications of tethers. R.S.F.

N85-20358*# McDonnell-Douglas Corp., St. Louis, Mo.
SUMMARY PRESENTATION TO THE ARTIFICIAL GRAVITY PANEL c52
George Butler *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 06S

General requirements for artificial gravity under a wide range of circumstances are considered. Appropriate or feasible ways of filling these requirements are explored with the focus on using tethers. The orbiter itself does not appear to be a good platform for tether research and development. Therefore, tethers that would be attached to space stations are emphasized. However, orbiter demonstrations and external tank demonstrations might be useful in exploring and developing tether operations prior to the space station. The general recommendations include requirements of artificial gravity in medicine and physiology, technology, microgravity sciences, habitability, operations in space, and what artificial gravity would mean to operations in space. R.S.F.

N85-20359*# Martin Marietta Corp., Denver, Colo.
SUMMARY PRESENTATION OF THE CONSTELLATIONS PANEL c12
Frank Williams *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

Tethered multiple spacecraft configurations are discussed relative to low Earth orbit, geosynchronous Earth orbit, and one, two, or three dimensional configurations. Attitude control, pointing, and stabilization of such tethered systems are addressed. R.S.F.

N85-20360*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUMMARY PRESENTATION OF THE TECHNOLOGY AND TEST PANEL c12
Paul Siemers *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 22A

Tether related technology issues were investigated along with potential applications. Several of the applications do not derive necessarily from nor are they related to a technology issue. Tether designs must concern itself with length requirements (whether the tether is to be flexible or stiff) and what the environmental impact is on the particular material that is proposed for the tether. As far as tether manufacturing techniques, a lot of technology related work is required to develop cost effective manfacturing capabilities for the future tether. There are techniques that are used on the ground now. However, after some of the proposed applications are determined to be feasible, it may be that the best way to manufacture the tether is to pretend the satellite is a spider and allow it to spin its own web in space. The technology required to developed tapered tethers was considered. Definition of the taper, where the center of that taper should be, and the taper's relation to the end masses are all of concern. R.S.F.

N85-20361*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATIONS OF TETHERS IN SPACE, VOLUME 2
Alfred C. Cron, comp. (General Research Corp., McLean, Va.) Washington Mar. 1985 319 p refs Workshop held in Williamsburg, Va., 15-17 Jun. 1983 2 Vol.
(Contract NAS8-35403)
(NASA-CP-2365; M-476; NAS 1.55:2365) Avail: NTIS HC A14/MF A01 CSCL 13I

Topics discussed include tethered satellites, tether deployment, satellite systems, science applications, electrodynamic interactions, transportation applications, artificial gravity, constellations, and technology and testing. For individual titles, see N85-20362 through N85-20376.

N85-20362*# National Aeronautics and Space Administration, Washington, D. C.
SPACE SCIENCE AND APPLICATIONS c12
Robert Hudson, Hasso B. Niemann (NASA. Goddard Space Flight

Center), Werner D. Kahn (NASA. Goddard Space Flight Center), James P. Murphy, Gerald M. Keating (NASA. Langley Research Center), Sergio Vetrella (Naples Univ., Italy), Will Webster (NASA. Goddard Space Flight Center), Joe Martin (Martin Marietta), Ray Schneider (Sperry), and Franco Mariani (Rome Univ., Italy) *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 6 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22A

The exploitation of the present tethered system and the need for repeat missions; multiple payloads placed along the tether; the extension of the present altitude limit to below 130 km; the development of free-flying tether satellites for studying both the Earth's atmosphere and ionosphere and also for studying the plantes; and a subtether were discussed. Areas of research were identified: aeronomy studies, gravity and magnetic potential mission, advanced sensors for geodynamics, and mapping and remote sensing. B.G.

N85-20363*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REPORT OF THE ELECTRODYNAMIC INTERACTIONS PANEL c32
Nobie H. Stone, Richard S. Taylor (Smithsonian Astrophysical Observatory), Susan Benford (NASA. Lewis Research Center), Joseph H. Binsack (MIT), Marino Dobrowolny (CNR, Italy), Patrick Finnegan (NASA. Lewis Research Center), Mario D. Grossi (Smithsonian Astrophysical Observatory), Marty Hudson (Martin Marietta, Denver), Devrie Intriligator (Carmel Research Center), Rim Kaminskas (TRW) et al *In its* Appl. of Tethers in Space, Vol. 2 Mar. 1985 19 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 20N

A wide range of opportunities is provided by the electrodynamic tether to more fully understand the generation of waves in plasmas, the behavior of field aligned currents, the behavior of large body-space plasma interactions, and for process simulation, using the electrodynamic tether to study processes and phenomena relevant to solar system and astrophysics plasma physics. The electrodynamic tether offers a means of study and experimentation in space which will provide a rich yield in new scientific results and will enhance the understanding of space plasma physics. It also has promising technological applications (e.g., the generation of electrical power and thrust) which may be highly significant to future space operations. Author

N85-20364*# Aeritalia S.p.A., Torino (Italy).
REPORT OF THE TRANSPORTATION PANEL c12
Ernesto Vallerani, Maxwell W. Hunter (Lockheed Missiles and Space Co.), Peter M. Bainum (Howard Univ.), Vinod J. Modi (British Columbia Univ.), Karl A. Faymon (NASA. Lewis Research Center), Ben Chang (Space Communication Company), Steven Lewis (NASA. Johnson Space Center), Jerry Yglesias (NASA. Johnson Space Center), Larry Edwards (NASA, Washington), Rudolph Adornato (Grumman Aerospace) et al *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 56 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22A

Tether applications for space transportation are covered: (1) payload boast; (2) upper stage boost; (3) E.T. deboost; (4) shuttle deboost; (5) shuttle docking ; (6) payload and OTV boost; (7) OTV payload boost; (8) lunar assist and eccentricity change; (9) aeromaneuvering by remote sail or kite; (10) electrodynamic deceleration; and (11) lunar and planetary applications. The first seven transfer momentum between two masses at the tether tips, and the remaining for use tethers for controlled interaction with the environment. B.G.

N85-20365*# McDonnell-Douglas Corp., St. Louis, Mo.
REPORT OF THE ARTIFICIAL GRAVITY PANEL c52
George Butler, Bob Freitag (NASA, Washington), Dox Doxiadis (Rockwell Corp.), Dave R. Criswell (Calspace), Charles Tang (JPL, California Inst. of Tech., Pasadena), Dennis Fielder (NASA. Johnson Space Center), John Gille (Martin Marietta), Paul Penzo (JPL, California Inst. of Tech., Pasadena), Ken Kroll (NASA. Johnson Space Center), Luigi Napolitano (Naples Univ., Italy) et al *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 36 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 06S

Tethers can be embodied into NASA's future space station development both as an experimental facility and as a technology for systems enhancement. Early action should be taken to ensure that the basic tether system be baselined into the initial space station architecture and that further concept studies be arranged to embody this basic capability. Space station tethered satellite operations would be continuous, subject to need and occasional association with local spacecraft operations in the proximity of the space station. The use of the tether principles would be further explored for attitude control and/or attitude stabilization damping, and proximity operations. For new tether uses, action should be taken to look at the tether for holding storage uses, proximity operations, and for extension of the capabilities of attached payloads systems. These applications should emphasize dynamic off-vertical tethers, rapid deployment, active-steered tethers, tether-boom combinations, and other concepts. B.G.

N85-20366*# National Aeronautics and Space Administration, Washington, D. C.
PHYSIOLOGICAL CONSIDERATIONS OF ARTIFICIAL GRAVITY c52
D. B. Cramer *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 20 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 06S

Weightlessness produces significant physiological changes. Whether these changes will stabilize or achieve medical significance is not clear. Artificial gravity is the physiological countermeasure, and the tether system represents an attractive approach to artificial gravity. The need for artificial gravity is examined. B.G.

N85-20367*# California Univ., San Diego, La Jolla.
ARTIFICIAL GRAVITY: TETHERS AND CONTAINERS
D. R. Criswell *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 3 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 13I

Tethers used in conjunction with containers offer a means of enhanced control of basic variables such as local acceleration, pointing and orientation, and protected or controlled environments against particle or electromagnetic radiation. Permanent occupancy of space will require the rapid exploration of the short and long term responses of many living organisms to the space environment or separated components of that environment. Tethers and ET facilities could provide the rapid establishment of laboratories in LEO within which to study living systems in a wide range of separate controlled environments for long periods of time, support large optical arrays; provide orbiting laboratories; and provide controlled environments within which the application of advanced manufacturing, assembly, control, and robotics could be developed to aid off-Earth industry and science and the conduct of more complex space operations. B.G.

N85-20368*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REPORT OF THE CONSTELLATIONS PANEL
David J. Bents, George vonTiesenhausen (NASA. Marshall Space Flight Center), Charles A. Lundquist (Alabama Univ., Huntsville), Pete Swan (California Univ., Los Angeles), Harris L. Mayer (Aerospace Corp.), Michael J. Mangano (JPL, California Inst. of Tech., Pasadean), Silvio Bergamasui (Padua Univ.), Franco Bevilacqua (Aeritalia), Frank Williams (Martin Marietta, New Orleans), Giovanni Rum (CNR, Italy) et al *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 16 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 13I

The purpose of a constellation is to provide a mode of distributing space systems in a method that could be advantageous and not eliminating the consolidation/aggregation advantages. The applicability of stabilization concepts to various orbital conditions was defined. B.G.

N85-20369*# Padua Univ. (Italy). Inst. of Applied Mechanics.
SOME ASPECTS OF ATTITUDE STABILITY OF TETHERED SPACE STATIONS **c18**
Silvio Bergamasui *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 13 p refs (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22B

The stability of attitude motion of space stations composed by platforms connected tethers is studied. The motion is assumed to be three dimensional and the station rigid. First, the well known linearized theory is adopted and the location of different configurations in the stability chart is found; second, a destabilizing feature of finite amplitude motion is outlined as a function of inertia parameters. Author

N85-20370*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REPORT OF THE TECHNOLOGY AND TEST PANEL
Paul Siemers, Stephen Graff (JPL, California Inst. of Tech., Pasadena), Harold Compton, Roy J. Duckett, Carlo Buonjiolno (CNR, Italy), George Wood, Darrell R. Tenney, David D. Lang (NASA. Johnson Space Center), Kenneth Sutton (Analytical Mechanics Associates), Paul Flanagan et al *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 27 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 13I

The state of technology relative to the Tethered Satellite System (TSS) was reviewed. The technology areas which could benefit from the TSS were defined. To support TSS design studies it is necessary to develop tether dynamic model computer codes for definition of mission and tether requirements. Present major codes are very elaborate, expensive to run, and not very user friendly. An additional technology concern was related to the manufacturing of tethers. The development of complex tethers (nonconducting-taper/double taper long > 100 km, conducting-embedded conduction, fiber optics, and superconducting) and their applications to space stations requires the development of manufacturing capabilities for both Earth-based as well as space-based systems. B.G.

N85-20371*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PULTRUSION PROCESS FOR FABRICATION OF TETHERS (PRELIMINARY CONCEPTS) **c15**
Ian O. MacConochie and Maywood L. Wilson *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 15 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22B

Three composite materials were manufactured by the pultrusion process, coiled on 24 inch diameter spools for a period of two months, uncoiled and evaluated for memory recall. These materials were pultruded to lengths of approximately 150 feet and cross section profiles were maintained at 0.143 inch in thickness by 0.566 inch in width. Mechanical properties were studied and results compared. The reinforcement material volume percent of each was identical. Of the three systems, the Kevlar reinforced composite had the highest specific strength, the lowest flexural modulus, and the lowest memory recall. Further evaluations of materials and fabrication technology of pultrusion should be conducted to address some problem areas encountered in this preliminary concept. Areas for further study are suggested. M.G.

N85-20372*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTRUMENTATION FOR APPLICATION NUMBER 1: MASS SPECTROMETRIC ANALYSIS OF THE BOUNDARY LAYER ASSOCIATED WITH THE TETHERED SATELLITE **c15**
George M. Wood *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 18 p refs (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22B

Knowledge about the boundary layer associated with high enthalpy flow fields has mostly been derived from measurements of physical properties. To further this understanding, the chemistry of the gaseous layer must be studied as well. This requires that instrumentation and measurement methods be developed that can analyze the gases while having a minimal effect on the flow field and composition. Because of its sensitivity and ability to identify species, the mass spectrometer is the most promising instrument for this application, although other spectroscopic methods are being evaluated as well. There are, however, several non-trivial problems that must be solved in order to apply the mass spectrometer, including the obtaining of a representative sample from near the model surface. These problems are being addressed in a research program to develop qualitative and quantitative measurement methods to examine the gas chemistry in several large hot-gas blowdown facilities, and to study the aerodynamics of the boundary layer associated with models in these facilities and in instrumented hypersonic vehicles. These methods can also be applied to the tethered satellite, which will provide a unique opportunity to obtain aerothermodynamic data that is unaltered by effects from the test facility. M.G.

N85-20373*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATION NUMBER 3: USING TETHERS FOR ATTITUDE CONTROL
R. M. Muller *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 10 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 13I

Past application of the gravity gradient concept to satellite attitude control produced attitude stabilities of from 1 to 10 degrees. The satellite members were rigidly interconnected and any motion in one part of the satellite would cause motion in all members. This experience has restricted gravity gradient stabilization to applications that need attitude stability no better than 1 degree. A gravity gradient technique that combines the flexible tether with an active control that will allow control stability much better than 1 degree is proposed. This could give gravity gradient stabilization much broader application. In fact, for a large structure like a space station, it may become the preferred method. Two possible ways of demonstrating the techniques using the Tethered Satellite System (TSS) tether to control the attitude of the shuttle are proposed. Then a possible space station tether configuration is shown that could be used to control the initial station. It is then shown how the technique can be extended to the control of space stations of virtually any size. G.L.C.

N85-20374*# Rome Univ. (Italy).
STUDY PROPOSAL FOR THE POSSIBLE USE OF ISS AS AN AERODYNAMIC FACILITY FOR AEROSPACE APPLICATIONS **c12**
Carlo Buonjiolno *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 5 p refs (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 22A

In order to determine the correct design parameters for an orbital transfer vehicle (OTV) to be used in conjunction with the envisaged space station system (SSS) it is essential to know the aerodynamic coefficients in the translational flow regime of the Earth's atmosphere at approximately 80 to 200 km. Because of the inherent difficulties relating to the duplication of the abovesaid translational flow regime in a ground based aerodynamic facility, another means of making this determination had to be developed. The proposed solution is the exploitation of the tether satellite system (TSS). By employing it as a spaceborne variable low density wind tunnel, the TSS appears to be a very appealing tool for such gas dynamic research. G.L.C.

N85-20375*# Naples Univ. (Italy).
TRANSPORT PROCESSES IN THE UPPER ATMOSPHERE c46
Giovanni M. Carlomagno *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 10 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 04A

A proposed study to measure aerodynamic and heat transfer coefficients within the thermo-fluid-dynamic range experienced by a tethered satellite and to compare the coefficients with previous correlations is discussed. Tests are proposed on a satellite of existing design, on a satellite design consisting of models carried aboard, and on a newly designed satellite devoted to energy, mass, and momentum transfer studies on particular geometries. R.J.F.

N85-20376*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
THE SATELLITE SAIL c15
Jerome Pearson *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 6 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 02B

It is proposed to suspend an airfoil from the Space Shuttle by a long tether into the upper atmosphere to provide a horizontal force on the Shuttle, thereby changing its orbital plane most efficiently. The airfoil would need high-temperature skin and tether, and remotely controlled flaps to adjust its angle of attack. The airfoil could also be used as a hypersonic facility to measure aerodynamic characteristics at extreme altitudes and velocities. This use would require a vertical lift force to counteract the drag force and prevent the Shuttle orbit from decaying too rapidly during the aerodynamic measurements. Author

N85-20377*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VARIABLE FRICTION SECONDARY SEAL FOR FACE SEALS Patent Application
Eliseo DiRusso, inventor (to NASA) Filed 16 Nov. 1984 8 p
(NASA-Case LEW-14170-1; NAS 1.71:LEW-14170-1;
US-Patent-Appl-SN-672224) Avail: NTIS HC A02/MF A01 CSCL 11A

Vibration and stability of a primary seal ring are controlled by a secondary seal system. An inflatable bladder which forms a portion of secondary seal varies the damping applied to this seal ring. The amplitude of vibration of the primary seal ring is sensed with a proximity probe that is connected to a microprocessor in a control system. The bladder pressure is changed by the control system to mitigate any sensed instability or vibration. NASA

N85-20378*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TUBE COUPLING DEVICE Patent Application
William N. Meyers and Leopold A. Hein, inventors (to NASA) Filed 18 Jan. 1985 12 p
(NASA-Case-MFS-25964-1; NAS 1.71:MFS-25964-1;
US-Patent-Appl-SN-692801) Avail: NTIS HC A02/MF A01 CSCL 13K

A first annular ring has a keyed opening sized to fit around the nut region of a male coupling and a second annular ring has a keyed opening sized to fit around the nut of a female coupling. Each ring has mating ratchet teeth and these rings are biased together, thereby engaging these teeth and preventing rotation of these rings. This in turn prevents the rotation of the male nut region with respect to the female nut. For tube-to-bulkhead locking, one facet of one ring is notched, and a pin is pressed into an opening in the bulkhead. This pin is sized to fit within one of the notches in the ring thereby preventing rotation of this ring with respect to the bulkhead. NASA

N85-20379# Department of the Air Force, Washington, D.C.
AUTOMATED PARTS STORAGE AND RETRIEVAL SYSTEM POSITIONING DEVICE AND METHOD Patent Application
G. M. Dands, inventor (to Air Force) Filed 11 Sep. 1984 11 p
(AD-D011494; US-Patent-Appl-SN-649445) Avail: NTIS HC A02/MF A01 CSCL 13/3

A device accurately positioning a conveyor, the conveyor having a conveyable periphery driveable by a motor is described. The device has a plurality of storage bins located along the periphery, having a coarse position sensor disposed for coupling to the motor and a plurality of fine position sensors with one of the fine sensors located at a respective fixed location adjacent to the periphery. At least one bin locator is associated with at least one of the bins. A home sensor is located at a fixed location adjacent to the periphery, with a home locator affixed to the periphery. GRA

N85-20380# Oak Ridge National Lab., Tenn. Center for Engineering Systems Advanced Research.
REAL TIME ALGORITHMS FOR ROBOTIC CONTROL OF TELEOPERATORS
S. M. Babcock and J. Barhen 1984 22 p refs Presented at 8th Robots Conf. and Exposition, Detroit, 4-7 June 1984
(Contracts W-7405-eng-26; DE-AC05-84OR-21400)
(DE85-001137; CONF-8406126-3) Avail: NTIS HC A02/MF A01

The Department of Energy recently established a Center for Engineering Systems Advanced Research (CESAR) at the Oak Ridge National Laboratory. The Center's charter is to address long-range energy related research in intelligent control systems operating in unstructured environments. Recent progress toward the development of real-time algorithms, incorporating inverse dynamics, for robotic control of manipulators with backdrivable actuation designed for teleoperation is reported. Parallel state-representation dynamics, concurrent algorithms, and algorithms for manipulators with centralized actuation are discussed. This activity is part of a larger effort with complementary tasks in robot strategy planning, sensor fusion, etc. DOE

N85-20381# Santa Clara Univ., Calif.
ENGINE WEAR AND COLD STARTABILITY OF METHANOL FUELED ENGINES.
L. H. Browning, J. B. Pullman, and R. K. Pefley 1984 4 p
(Grant DE-FG03-84CE-50036)
(DE85-001208; DOE/CE-50036/T8) Avail: NTIS HC A02/MF A01

While alcohol fuels have moved towards commercialization, two problems have not been satisfactorily resolved. These are cold-start, warm-up driveability and corrosion and wear of fuel system and engine parts. In additin, environmental factor assessments must continuously be made if the public is to be assured that the alcohols are more benign than petroleum in terms of environmental, health, and safety factors. DOE

N85-20382# Argonne National Lab., Ill. Energy and Environmental Systems Div.
INTRODUCING ENGINE INNOVATIONS: AN EXAMINATION OF FUTURE MARKETS FOR BRAYTON AND STIRLING AUTOMOTIVE ENGINES
Danilo J. Santini Aug. 1984 40 p refs Presented at the 64th Ann. Transportation Res. Board Meeting, Washington, D.C., 21 Jan. 1985
(Contract W-31-109-eng-38)
(DE84-016319; CONF-850115-1) Avail: NTIS HC A03/MF A01

A general and particular view of the process of engine innovation was examined. It was suggested that careful corporate and national preparation for automotive innovation is necessary. To that end, advanced (year 2000) engine and vehicle characteristics from the Technology Assessment of Productive Conservation in Urban Transport were used to estimate that the Stirling and Brayton engines are likely to have very specific and different markets. Driving cycle behavior of the engines in an urban and suburban setting was examined to show that the Stirling's most likely market will be as a specialized urban vehicle, while the Brayton's best market will be as a specialized surburban and inter-city vehicle. It was argued that neither engine has the properties necessary to become a universal replacement for all purpose vehicles using advanced Otto-cycle and diesel engines,

but that proper use of these vehicles could ultimately help efficiently mitigate national problems of urban air pollution (the Stirling) and/or excessive fuel consumption. DOE

N85-20383# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
ROBOTICS AT SAVANNAH RIVER SITE: ACTIVITY REPORT
J. S. Byrd Sep. 1984 35 p
(Contract DE-AC09-76SR-00001)
(DE85-003657; DPST-84-736) Avail: NTIS HC A03/MF A01

The objectives of the Robotics Technology Group at the Savannah River Laboratory are to employ modern industrial robots and to develop unique automation and robotic systems to enhance process operations at the Savannah River site (SRP and SRD). The incentives are to improve safety, reduce personnel radiation exposure, improve product quality and productivity, and to reduce operating costs. During the past year robotic systems have been installed to fill chemical dilution vials in a SRP laboratory at 772-F and remove radioactive waste materials in the SRL Californium Production Facility at 773-A. A robotic system to lubricate an extrusion press was developed and demonstrated in the SRL robotics laboratory and is scheduled for installation at the 321-M fuel fabrication area. A mobile robot was employed by SRP for a radiation monitoring task at a waste tank top in H-Area. Several other robots are installed in the SRL robotics laboratories and application development programs are underway. The status of these applications is presented. DOE

N85-20384# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
A COMPUTERIZED STUDY OF RIGID CONES PENETRATING ALUMINUM TARGETS
Steven Hancock and Helen Hancock Oct. 1984 51 p refs In SWEDISH; ENGLISH summary
(FOA-C-20561-D4; ISSN-0347-3694) Avail: NTIS HC A04/MF A01; Research Institute for National Defence, Stockholm KR 25

Calculations of steel projectiles impacting a soft aluminum target are summarized. A coupled Euler-Lagrange program was used. Results show that: (1) drag coefficients are much lower than those given by the expansion theory for a spherical cavity; (2) the elastic-plastic resistance lies in the area predicted by the expansion theory for a cavity; (3) shear stress does not exceed the normal predicted values; (4) an important parameter for the analytic model is the speed at which the hydrodynamic drag force equals the elastic-plastic force; and (5) drag stress is maximum at the projectile tip and becomes lower radially, while the elastic-plastic stress is approximately constant (for a 90 deg arc cone).
Author (ESA)

N85-20385# Purdue Univ., Lafayette, Ind.
ADVANCED INDUSTRIAL ROBOT CONTROL SYSTEMS Technical Report, 1Mar. 1982 - 1 Mar. 1983
R. P. Paul, J. Y. S. Luh, S. Y. Nof, and V. Hayward Jan. 1984 153 p refs
(Grants NSF MEA-81-19884; NSF APR-77-14533)
(PB85-110773; TR-84/10; NSF/MEA-84006; Rept-9) Avail: NTIS HC A08/MF A01 CSCL 13I

Achievements in a program undertaken to extend the flexibility and usefulness of current industrial robots are reported for the period 1977 through January 1981. Major accomplishments include development work and simulation in motion in joint coordinates; experimentation on joint torque sensing; and the development of the Robot Time and Motion (RTM) technique for analyzing and specifying work for robots. Results achieved since 1981 discussed, including the creation of manipulator programming primitives embedded in the C computer programming system running under the UNIX operating systems; and a two-part investigation of collision avoidance: off-line collision free path planning and on-line collision avoidance traveling. Appendices include decision aids for planning industrial robot operations and an analysis of robot work characteristics. GRA

N85-20386# Purdue Univ., Lafayette, Ind.
ADVANCED INDUSTRIAL ROBOT CONTROL SYSTEMS Technical Report, 1 Mar. 1983 - 1 Sep. 1984
R. P. Paul, J. Y. S. Luh, S. Y. Nof, and V. Hayward Jul. 1984 308 p refs
(Grants NSF MEA-81-199884; NSF APR-77-14533)
(PB85-110781; TR-84/25; NSF/MEA-84007; Rept-9) Avail: NTIS HC A14/MF A01 CSCL 13I

Achievements in research undertaken to extend the flexibility and usefulness of current industrial robots are reported for the period from 1978 through March 1983. These include the initial theoretical development work and simulation of a language system known as PAL; an approach to the Newton-Euler formulation of dynamics and resolved acceleration control for manipulators; and the development of a method of variable branch-and-bound which schedules the computation of tasks by distributing the load in a sequential order among the central processing units under the series-parallel precedence constraints. Results achieved since march 1983 are highlighted, with a focus on the integration of the robot control into an existing high level language, the Robot C Control Library (RCCL). GRA

N85-20387# Research Triangle Inst., Research Triangle Park, N.C.
STABILITY EVALUATION OF SULFUR DIOXIDE NITRIC OXIDE AND CARBON MONOXIDE GASES IN CYLINDERS
R. C. Shores and F. Smith Nov. 1984 52 p refs
(Contract EPA-68-02-3767)
Avail: NTIS HC A04/MF A01: CSCL 13D

The US EPA recommends in their EPA Traceability Protocol 1 and 2 that reactive gases be reanalyzed every six months. The purpose of this study was to assess. The stability of selected reactive gases as a function of time was determined to assess the feasibility of extending the recertification period. The reactive gases in this study were contained in aluminum and steel cylinders and included: carbon monoxide in air (CO/Air); carbon monoxide in nitrogen (CO/N2); nitric oxide in nitrogen (NO/N2); and sulfur dioxide in nitrogen (SO2/N2). Author (GRA)

N85-20388# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Engineering and Public Policy.
EXPLORATORY ASSESSMENT OF SECOND GENERATION ROBOTICS AND SENSOR-BASED SYSTEMS Final Report
Robert U. Ayres and Steven M. Miller Sep. 1984 287 p
(Grant NSF PRA-83-02137)
(PB85-132793; NSF/PRA-84010) Avail: NTIS HC A13/MF A01 CSCL 13H

An overview of the first systematic assessment of the potential impacts of robots on employment and productivity is provided. Four papers are included that (1) address the role of tools, machines, and controls in human society; (2) review three broad classes of development (extensions and capabilities of commercially available robots, integration of sensory information processing with robotic devices, and integration of robots, machine tools, part handling and transport devices into flexible maufacturing systems); (3) analyze the extent to which unit costs and production labor requirements could be reduced with more widespread use of robots; and (4) classify 101 industries as being dominated by custom/small batch production, midbatch production, large batch production, or mass production. GRA

N85-20016# Joint Publications Research Service, Arlington, Va.
NOVEL CONCEPT IN DESIGN OF ASEA'S NEW ASSEMBLY ROBOT
Michel Defaux *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 44-45 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 11 Oct. 1984 p 54 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

N85-20017# Joint Publications Research Service, Arlington, Va.
FRENCH FIRM HAS MOST ADVANCED CONTINUOUS-CASTING MACHINE

Jean Roume *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 46-50 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 18 Oct. 1984 p 16-17 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

N85-20076# Joint Publications Research Service, Arlington, Va.
KINETICS OF REACTION OF METALS AND NON-METALS DURING DIFFUSION WELDING Abstract Only
V. A. Bachin *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 39-40 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 2, Feb. 1984 p 25-27 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20077# Joint Publications Research Service, Arlington, Va.
COLLAPSE AND REMOVAL OF DISCONTINUITIES IN JOINT ZONE DURING DIFFUSION WELDING Abstract Only
V. S. Gostomelskiy *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 40 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 2, Feb. 1984 p 28-30 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20078# Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF EFFECTIVENESS OF ELECTRON BEAM WELDING OF TITANIUM ALLOYS UP TO 40 mm IN THICKNESS BY VERTICAL OR HORIZONTAL BEAM Abstract Only
Olshanskiy, A. P. Lopatko, and V. R. Petrenko *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 41 Transl. into ENGLISH from Svarochn. Proizv. (Moscow), no. 3, Mar. 1984 p 31-32 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20080# Joint Publications Research Service, Arlington, Va.
WELDABILITY OF ALLOY ABM1 TO ALLOY 1201 Abstract Only
A. N. Fokanov, Ye. A. Kuznetsova, V. D. Popov, and R. S. Kurochko *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 42 Transl. into ENGLISH from Svarochn. Proizv. (Moscow), no. 3, Mar. 1984 p 17-19 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20081# Joint Publications Research Service, Arlington, Va.
ULTRASONIC LARGE-DIAMETER PIPE WELD TESTING INSTALLATIONS Abstract Only
I. Ya. Shevchenko, V. F. Baldakov, and V. A. Filippenkov *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 42 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 3, Mar. 1984 p 40-42 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20082# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF TRANSIENT ZONE IN DIFFUSION WELDING OF TsTS-19 PIEZOCERAMIC WITH AMg6 ALLOY Abstract Only
V. G. Novikov, A. I. Yekimov, V. Ye. Kravchenko, N. F. Kazakov, and V. A. Bachin *In its* USSR Rept.: Mater. Sci. and Technol. (JPRS-UMS-84-005) 18 Jul. 1984 p 43 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 3, Mar. 1984 p 62-64 (For primary document see N85-20044 11-26)
Avail: NTIS HC A04/MF A01

N85-20166# Joint Publications Research Service, Arlington, Va.
ROBOT PRODUCTION LINES IN OPERATION
In its East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 1-2 refs Transl. into ENGLISH from Otlet (Budapest), 13 Dec. 1984 p 37 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

N85-20169# Joint Publications Research Service, Arlington, Va.
NEW PCB PRODUCTION FOR ROBOTICS APPLICATION
Juergen W. Boehme *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 16-17 Transl. into ENGLISH from Freiheit (Halle, East Germany), 9 Nov. 1984 p 10 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

N85-20170# Joint Publications Research Service, Arlington, Va.
INCREASED USE OF CNC IN MACHINE TOOL CONSTRUCTION
R. Waetzig *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 18-22 Transl. into ENGISH from Fertingungstech. und Betr. (East Berlin), v. 34, no. 11, 1984 p 646-647, 676 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

N85-20172# Joint Publications Research Service, Arlington, Va.
NEW CNC SYSTEMS DESCRIBED
W. Herbst *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 33-38 Transl. into ENGLISH from Fertigungstech. und Betr. (East Berlin), v. 34, no. 11, 1984 p 652-658 (For primary document see N85-20165 11-31)
Avail: NTIS HC A02/MF A01

N85-20179# Joint Publications Research Service, Arlington, Va.
OVERVIEW OF LEADING-EDGE RESEARCH AT FRENCH CNRS LAB
P. Truc *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 9-25 refs Transl. into ENGLISH from Micro et Robots (Paris), Jan. 1985 p 42-50 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

N85-20180# Joint Publications Research Service, Arlington, Va.
FRENCH PANEL MAKES SPECIFIC PROPOSALS FOR ROBOTICS RESEARCH. CURRENT STATE OF FRENCH ROBOTICS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 27-99 Transl. into ENGLISH from the book "Mission Robotique 1" Paris, 1984 p 27-29 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

N85-20185# Joint Publications Research Service, Arlington, Va.
FIAT INTRODUCES 1000-CC ENGINE
In is West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 7-19 Transl. into ENGLISH from ATA-Ing. Automotoristica (Turin), Oct. 1984 p 551-558 (For primary document see N85-20183 11-31)
Avail: NTIS HC A05/MF A01

N85-20204# Joint Publications Research Service, Arlington, Va.
NEW AIR SUPPLY-PRIME MOVER FACILITY FOR ENGINE TESTS DETAILED
In its China Rept.: Sci. and Technol. (JPRS-CST-84-032) 22 Oct. 1984 p 9-15 Transl. into ENGLISH from Guoji Hankong (Peking), no. 7, Jul. 1984 p 30-32 (For primary document see N85-20202 11-31)
Avail: NTIS HC A03/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-20389*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NDE FOR HEAT ENGINE CERAMICS
Stanley J. Klima 1984 13 p refs Presented at 22nd Automotive Technol. Develop. Contractors Coordination Meeting (ATD/CCM),

29 Oct. - 2 Nov. 1984, Dearborn, Mich.; sponsored by Society of Automotive Engineers
(NASA-TM-86949; E-2470; NAS 1.15:86949) Avail: NTIS HC A02/MF A01 CSCL 14B

Radiographic, ultrasonic, and scanning laser acoustic microscopy (SLAM) techniques were used to characterize silicon nitride and silicon carbide MOR bars in various stages of fabrication. Conventional and microfocus x-ray techniques were found capable of detecting minute high density inclusions in as-received powders, green compacts, and fully densified specimens. Significant density gradients in sintered bars were observed by radiography, ultrasonic velocity, and SLAM. Ultrasonic attenuation was found sensitive to microstructural variations due to grain and void morphology and distribution. SLAM was also capable of detecting voids, inclusions, and cracks in finished test bars. It was determined that thermoacoustic microscopy techniques have promise for application to green and densified ceramics. R.J.F.

N85-20390*# Massachusetts Inst. of Tech., Cambridge.
STRESS WAVES IN AN ISOTROPIC ELASTIC PLATE EXCITED BY A CIRCULAR TRANSDUCER Final Report
Hira Karagulle, James H. Williams, Jr., and Samson S. Lee Washington NASA Mar. 1985 52 p refs
(Grant NAG3-328)
(NASA-CR-3877; NAS 1.26:3877) Avail: NTIS HC A04/MF A01 CSCL 14D

Steady state harmonic stress waves in an isotropic elastic plate excited on one face by a circular transducer are analyzed theoretically. The transmitting transducer transforms an electrical voltage into a uniform normal stress at the top of the plate. To solve the boundary value problem, the radiation into a half-space is considered. The receiving transducer produces an electrical voltage proportional to the average spatially integrated normal stress over its face due to an incident wave. A numerical procedure is given to evaluate the frequency response at a receiving point due to a multiply reflected wave in the near field. Its stability and convergence are discussed. Parameterization plots which determine the particular wave whose frequency response has maximum magnitude compared with other multiple reflected waves are given for a range of values of dimensionless parameters. The effects of changes in the values of the parameters are discussed. B.G.

N85-20391# Hanford Engineering Development Lab., Richland, Wash.
INFRARED-THERMAL WAVE SCANNER FOR NDE OF NAVAL THERMAL SPRAY COATINGS
D. R. Green, C. R. Wandling, and F. B. Gatto 27 Feb. 1984 29 p refs Presented at Intern. Conf. on Met. Coatings, San Diego, Calif., San Diego, Calif., 9 Apr. 1984
(Contract DE-AC06-76FF-02170)
(DE85-002237; HEDL-SA-2995-FP; CONF-8404135-7) Avail: NTIS HC A03/MF A01

An engineering prototype scanning system was completed and evaluated in shop tests. The system uses advanced emissivity independent infrared scanning and thermal wave techniques to detect nonbonds and differentiate them from variations in coating density and thickness. A computer is used to control the scanning process, analyze the data and produce pseudo three-dimensional scan maps that can easily be interpreted. A heat pulse injected into the test objects surface generates a thermal wave that propagates inward at a rate that depends upon the thermal impedances it encounters. Measurement of the surface thermal impedance can be accomplished by forming the ratio of the temperature response to heat flow for sinusoidal waves, or for transforms of transient waves, at the test objects surface. The surface thermal impedance is a true complex quantity, having both phase and amplitude. It is also frequency dependent, and this make it possible to distinguish between impedance differences resulting from coating density differences, thickness differences and nonbonds. DOE

N85-20392# Oak Ridge National Lab., Tenn.
DIRECT COMPARISON OF UNLOADING COMPLIANCE AND POTENTIAL DROP TECHNIQUES IN J-INTEGRAL TESTING
J. J. McGowan and R. K. Nanstad 1984 6 p refs Presented at the Fall Conf. of the Soc. for Exptl. Mech., Milwaukee, 4 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001550; CONF-8411104-1) Avail: NTIS HC A02/MF A01

Single-specimen J-integral testing is performed commonly with the unloading compliance technique. Use of modern instrumentation techniques and powerful desktop computers have made this technique a standard. However, this testing technique is slow and tedious, with the loading rate fixed at a slow quasi-static rate. For these reasons the dc potential drop technique was investigated for crack length measurement during a J-integral test. For direct comparison, both unloading compliance and potential drop were used simultaneously during a J-integral test. The results showed good agreement between the techniques. However, the potential drop technique showed an offset in crack length due to plastic blunting processes. Taking this offset into account, J/sub Ic/ values calculated by both techniques compared well. DOE

N85-20393# Ames Lab., Iowa.
APPLICATION OF HYSTERESIS MODELLING TO THE NONDESTRUCTIVE INSPECTION OF STRESS
D. C. Jiles, S. Habermehl, and D. L. Atherton (Queen's Univ., Kingston, Ontario) Mar. 1984 10 p refs Presented at the 1st Seminar on Nondestructive Evaluation of Ferromagnetic Materials, Houston, Tex., 1 Mar. 1984
(Contract W-7405-eng-82)
(DE85-003081; IS-M-528; CONF-8403158-1) Avail: NTIS HC A02/MF A01

To use magnetic methods to study the effects of stress on the properties of ferromagnetic materials it is necessary to have a reliable model of the magnetic hysteresis behavior of the material. The effects of stress on the various parameters defining hysteresis can then be determined. Later these parameters may be calculated from hysteresis measurements in order to evaluate the stress. The situation is likely to be further complicated by such factors as residual microstrain in the sample and if the elastic limit is exceeded, by plastic deformation. Nevertheless the outlines of the magnetic method given show how it can be used for nondestructive inspection of stress. DOE

N85-20394# Centro Informazioni Studi Esperienze, Milan (Italy).
LEAK MONITORING IN HIGH PRESSURE PREHEATERS BY A NONINVASIVE ULTRASONIC METHOD
M. Famiglietti, S. Ghia (Ente Nazionale per l'Energia Electricca, Milan, Italy), and D. Scandolo 1984 13 p refs Presented at 3rd European Conf. on Nondestruct. Testing, Florence, 15-18 Oct. 1984
(Contract ENEL/CRTN-CISE-RAF-096/00)
(CISE-2373) Avail: NTIS HC A02/MF A01

An acoustic monitoring technique for leak detection in high pressure feedwater preheaters is presented. Leak detection is based on the ultrasonic noise produced by the turbulent leak outflow and transmitted by the metal of the component. The piezoelectric acoustic emission transducers are installed on the outer side of the shell of preheaters. The underlying physical principles of the acoustic monitoring technique are discussed. Operational results are presented. Author (ESA)

N85-20395# Centro Informazioni Studi Esperienze, Milan (Italy).
LEAK DETECTION BY ACOUSTIC EMISSION MONITORING IN POWER PLANT HIGH PRESSURE PREHEATERS
M. Famiglietti, D. Scandolo, F. Tonolini, S. Ghia (Ente Nazionale per l'Energia Electricca, Milan, Italy), and V. Regis (Ente Nazionale per l'Energia Electricca, Milan, Italy) 1984 22 p refs Presented at EPRI Conf. on Incipient Failure Detection in Power Plants, Lake Buena Vista, Fla., 10-12 Oct. 1984
(Contract ENEL/CRTN-CISE-RAF-096/00)
(CISE-2392) Avail: NTIS HC A02/MF A01

An acoustic monitoring technique for leak detection in feedwater preheaters is presented. Leak detection is based on the ultrasonic noise produced by the turbulent leak outflow and

transmitted by the metal of the component. The sensors are piezoelectric acoustic emission transducers, installed on the outer side of the shell of preheaters. Results in laboratory and in power plants show excellent reliability and performance. Author (ESA)

N85-20171# Joint Publications Research Service, Arlington, Va.
RELIABILITY OF DNC SYSTEM EXAMINED
J. Schaller *In its* East Europe Rept: Sci. and Technol. (JPRS-ESA-85-009) 26 Feb. 1985 p 23-32 refs Transl. into ENGLISH from Fertigunstech. und Betr. (East Berlin), v. 34, no. 11, 1984 p 648-651 (For primary document see N85-20165 11-31)
Avail: NTIS HC A04/MF A01

N85-20198# Joint Publications Research Service, Arlington, Va.
RADIOGRAPHIC INSPECTION OF BUTT WELDS DESCRIBED
Junzhe Zhang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 1-10 Transl. into ENGLISH from Wusun Jiance (China), no. 2, 1984 p 16-19 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-20396*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOCAL STRAIN REDISTRIBUTION CORRECTIONS FOR A SIMPLIFIED INELASTIC ANALYSIS PROCEDURE BASED ON AN ELASTIC FINITE-ELEMENT ANALYSIS
Albert Kaufman and Shoi Y. Hwang (South Carolina State Coll., Orangeburg) Mar. 1985 14 p refs To be presented at the 21st AIAA/SAE/ASME Joint Propulsion Conf., Monterey, Calif., 8-11 Jul. 1985
(NASA-TP-2421; E-2373; NAS 1.60:2421) Avail: NTIS HC A02/MF A01 CSCL 20K

Strain redistribution corrections were developed for a simplified inelastic analysis procedure to economically calculate material cyclic response at the critical location of a structure for life prediction proposes. The method was based on the assumption that the plastic region in the structure is local and the total strain history required for input can be defined from elastic finite-element analyses. Cyclic stress-strain behavior was represented by a bilinear kinematic hardening model. The simplified procedure predicts stress-strain response with reasonable accuracy for thermally cycled problems but needs improvement for mechanically load-cycled problems. Neuber-type corrections were derived and incorporated in the simplified procedure to account for local total strain redistribution under cyclic mechanical loading. The corrected simplified method was used on a mechanically load-cycled benchmark notched-plate problem. The predicted material response agrees well with the nonlinear finite-element solutions for the problem. The simplified analysis computer program was 0.3% of the central processor unit time required for a nonlinear finite-element analysis. EAK

N85-20397# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OPTIMIZATION OF PRESSURE VESSELS WITH STANDARD INTERCEPTING SPHERES [OTIMIZACAO DE VASOS DE PRESSAO DO TIPO ESFERAS INTERCEPTANTES]
Joao Andrade deCarvalho, Jr. and Demetrio Bastos Netto Sep. 1984 13 p refs In PORTUGUESE; ENGLISH summary Presented at the 3rd Simp. Brasil. sobre Tubulacoes e Vasos de Pressao, Salvador, Brazil, 29-31 oct. 1984
(INPE-3276-PRE/600) Avail: NTIS HC A02/MF A01

Intercepting spheres have practical usefulness in the design of pressure vessels for weight limited situations, as in the case of spatial and oceanic applications. The case of N intercepting spheres which produce a reduction of pressure vessel mass in comparison with a single sphere with the same internal volume is examined. It is shown that this reduction approaches a limiting value of 39.5% as N increases. E.A.K.

N85-20398*# National Academy of Sciences - National Research Council, Washington, D. C. National Materials Advisory Board.
ASSURING STRUCTURAL INTEGRITY IN ARMY SYSTEMS Final Report, 1 Apr. 1983 - 31 Dec. 1984
National Academy Press 28 Feb. 1985 72 p refs Sponsored in part by NASA
(Contract MDA903-82-C-0434)
(NASA-CR-175492; NAS 1.26:175492) Avail: NTIS HC A04/MF A01 CSCL 20K

The object of this study was to recommend possible improvements in the manner in which structural integrity of Army systems is assured. The elements of a structural integrity program are described, and relevant practices used in various industries and government organizations are reviewed. Some case histories of Army weapon systems are examined. The mandatory imposition of a structural integrity program patterned after the Air Force Aircraft Structural Integrity Program is recommended and the benefits of such an action are identified. Author

N85-20399# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
THE USE OF ANALYTICAL MODELS TO INTERPRET DATA PROPERLY
M. Thompson and P. C. French Sep. 1983 47 p refs Presented at Brit. Soc. for Strain Meas./I. Mech. E. Joint Conf. on Meas. in the Vibration Environ., Durham, England, 12-15 Sep. 1983
(ERS-E.341) Avail: NTIS HC A03/MF A01

The use of a priori information about a physical system to increase the information gleaned from a limited set of measurements is discussed. The general philosophy behind the process is outlined. The mathematical and computational tools needed to perform the operations are derived. Application to structural dynamics is illustrated. For individual titles, see N85-20400 through N85-20401.

N85-20400# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
THE USE OF ANALYTICAL MODELS TO INTERPRET MEASURED DATA PROPERLY. 1. GENERAL BACKGROUND THEORY
P. C. French and M. Thompson *In its* The Use of Anal. Models to Interpret Data Properly Sep. 1983 18 p refs (For primary document see N85-20399 11-39)
Avail: NTIS HC A03/MF A01

A mathematical foundation for model refinement by use of experimental data with sensitivity analysis is outlined. Modeling for modal analysis is examined. A sensitivity analysis and model refinement system for structural dynamics was devised and implemented. The system involves 8000 lines of FORTRAN 77 program and results are encouraging. Author (ESA)

N85-20401# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
THE USE OF ANALYTICAL MODELS TO INTERPRET MEASURED DATA PROPERLY. 2. THE APPLICATION TO MODAL ANALYSIS OF STRUCTURES
M. Thompson and P. C. French *In its* The Use of Anal. Models to Interpret Data Properly Sep. 1983 28 p refs (For primary document see N85-20399 11-39)
Avail: NTIS HC A03/MF A01

A nontrivial structure is analyzed to produce a model and how modal analysis measurements are taken. These are used to correct the model. The validity of the model is checked by using it to predict modifications that are deliberately made to the model. The constraints within which the whole process is validated are explored. Author (ESA)

N85-20402# Naval Ship Research and Development Center, Bethesda, Md.
A NUMERICAL APPROACH FOR THE VIBRATION ANALYSIS OF AN AXISYMMETRIC SHELL STRUCTURE WITH A NONUNIFORM EDGE CONSTRAINT Final Report
Y. F. Hwang Dec. 1984 32 p
(AD-A149286; DTNSRDC-84/061) Avail: NTIS HC A03/MF A01 CSCL 12/1

A numerical approach for computing the eigenvalues and eigenfunctions of an axisymmetric shell with a nonaxisymmetric edge constraint is presented. The shell structures are modeled without constraint by an assemblange of axisymmetric shell elements. The constraint at any point along the edge circumference may be imposed by two linear springs acting against the axial and the radial degress of freedom, and by a torque spring acting against the rotational degree of freedom. The nonuniform constraint is thus represented by the arbitrary distribution of these spring constraints per unit length along the circumference. This arbitrary distribution of spring constants is then resolved by a Fourier series expansion. Utilizing the natural modes of the unconstrained shell as the generalized coordinates, the equations of motion which include the effects of a nonuniform constraint, are derived. The mass and the stiffness matrices of these equations of motion are used as inputs for solving the linear numerical eigenvalue problem. A circular plate, which can be considered as an extreme case of an axisymmetric shell, is used as a numerical example. For a simply supported circular plate with a sinusoidal variation of rotational edge constraint, the computed results agree well with the data available in the literature. GRA

N85-20403# Pacific Northwest Lab., Richland, Wash.
EFFECT OF INPUT DISTRIBUTIONS ON THE PROBABILISTIC FRACTURE MECHANICS ANALYSIS OF REACTOR PRESSURE VESSELS
A. M. Liebetrau and F. A. Simonen Jun. 1984 21 p refs Presented at the ASME Pressure Vessel and Piping Conf., San Antonio, 17-21 Jun. 1984
(Contract DE-AC06-76RL-01830)
(DE85-000832; PNL-SA-12038; CONF-840647-30) Avail: NTIS HC A02/MF A01

The effects of two of the more important variables, the shift in reference temperature for nil ductility transition (DELTA RT sub NDT) and flaw size, on the probability of vessel failure during a pressurized thermal shock (PTS) incident are studied. Uncertainties in the copper content of weld material have the greatest effect on the variability of simulated values of shift in RT sub NDT. The effects of nickel content and fluence are lesser, but significant. These results are inherent in the structural form of the equation used to predict shift. The simulated probabilities of vessel failure are found to vary widely for some of the more popular flaw-depth distributions. Small differences in the way flaw depths are rounded in order to make them compatible with existing simulation codes have profound effects on results. Data on measuring flaw lengths are also considered. When length-corrected stress intensity factors are computed for finite-length flaws, simulated failure probabilities decrease. DOE

N85-20404# Ames Lab., Iowa.
ELASTIC COMPLIANCE OF IMPERFECT INTERFACES: REVIEW AND RELATIONSHIP TO ULTRASONIC SCATTERING
J. M. Baik and R. B. Thompson 1984 13 p refs Presented at Prog. in Quant. NDE, San Diego, Calif., 8 Jul. 1984
(Contract W-7405-eng-82)
(DE85-003068; IS-M-526; CONF-840738-10) Avail: NTIS HC A02/MF A01

A quasi-static model for ultrasonic transmission and reflection at imperfect interfaces is presented. The interface is represented by a distributed spring, determined by the change in static compliance of the medium with respect to one with a perfect interface, and a distributed mass, representing excess mass at the interface. Comparison of the model predictions to exact solutions illustrates the model's accuracy at low frequencies. The spring stiffnesses can be derived from existing solutions for the elastic displacement of materials containing cracks and inclusions under static loads, as is illustrated for several simple cases. Applications of the model to the study of the characteristics of partially contacting surfaces in several areas of current interest are identified. R.S.F.

N85-20405# Hanford Engineering Development Lab., Richland, Wash.
DEVELOPMENT OF AN AUTOMATED MINIATURE CHARPY TEST METHOD
W. L. Hu Aug. 1983 20 p refs Presented at Symp. on the Use of Nonstandard Subsized Specimens for Irradiated Testing, Albuquerque, N. Mex., 23 Sep. 1983
(Contract DE-AC06-76FF-02170)
(DE85-003011; HEDL-SA-2947-FP) Avail: NTIS HC A02/MF A01

A miniature instrumented Charpy impact test device was developed and automated for testing irradiated specimens. The DBTT for various types of Charpy specimens made of ferritic alloys were determined. The upper shelf energy for each type of Charpy specimen could be normalized by a generalized term of the state of stress at the notch root. DOE

N85-20406# Argonne National Lab., Ill.
LEAKAGE-FLOW-INDUCED VIBRATION OF A TUBE-IN-TUBE SLIP JOINT
T. M. Mulcahy 1984 14 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-007301; CONF-841201-3) Avail: NTIS HC A02/MF A01

The susceptibility of a cantilevered tube conveying water to self-excitation by leakage flow through a slip joint was assessed experimentally. The slip joint is formed by inserting a smaller, rigid tube into the free end of the cantilevered tube. Variations of the slip joint annular gaps and engagement lengths were tested. Several mechanisms for self-excitation are described. DOE

N85-20407# Argonne National Lab., Ill.
FLOW-INDUCED TUBE VIBRATION THRESHOLDS IN HEAT EXCHANGERS FROM SHELLSIDE WATER TESTS
H. Halle, J. M. Chenoweth (Heat Transfer Research, Inc.), and M. W. Wambsganss 1984 15 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-006603; CONF-841201-4) Avail: NTIS HC A02/MF A01

Typical industrial shell-and-tube heat exchanger configurations are investigated experimentally for the occurrence of potentially damaging tube vibration as a function of flowrate. The effort is part of a program to develop vibration avoidance criteria to be integrated and optimized with the advanced thermal, hydraulic, and mechanical design methods now available. The tests use a 0.6-m (2-ft)-diameter, 3.7-m (12-ft)-long shell containing a removable tube bundle whose components are readily rearranged or replaced. The 15 different full tube bundle configurations tested represent various combinations of parameters: triangular or square tube layout patterns with different orientations to the flow, number of crosspasses, sizes of nozzles, plain or finned tubes. The heat exchanger is tested with waterflow on the shellside to determine a critical threshold, above which a small increase in the flowrate initiates a fluid elastic instability resulting in large amplitude vibration. The test conditions, the critical flowrates, the vibration frequencies, and the locations of the tubes most susceptible to vibration are presented. DOE

N85-20408# Hanford Engineering Development Lab., Richland, Wash.
DESIGN AND USE OF NONSTANDARD TENSILE SPECIMENS FOR IRRADIATED MATERIALS TESTING
N. F. Panayotou Oct. 1984 45 p refs Presented at Symp. on the Use of Nonstandard Subsized Specimens for Irradiated Testing, Albuquerque, N. Mex., 2 Oct. 1984
(Contract DE-AC06-76FF-02170)
(DE85-001071; HEDL-SA-2984-FP; CONF-8410158-1) Avail:

NTIS HC A03/MF A01

Miniature, nonstandard, tensile-type specimens have been developed for use in radiation effects experiments at high energy neutron sources where the useful radiation volume is as small as a few cubic centimeters. The end result of our development is a sheet-type specimen, 12.7 mm long with a 5.1 mm long, 1.0 mm wide gage section, which is typically fabricated from 0.25 mm thick sheet stock by a punching technique. Despite this miniature geometry, it has been determined that the data obtained using these miniature specimens are in good agreement with data obtained using much larger specimens. This finding indicates that miniature tensile specimen data may by used for engineering design purposes. Furthermore, it is clear that miniature tensile specimen technology is applicable to fields other than the study of radiation effects. The miniature specimen technology is described and data obtained from these miniature specimens are compared to data obtained from much larger specimens. DOE

N85-20409# Syracuse Univ., N. Y. Dept. of Mechanical and Aerospace Engineering.

THICKNESS EFFECTS OF FRACTURE TOUGHNESS Final Report

H. W. Liu and Q. Chen Oct. 1984 54 p refs

(Contract DE-AC02-81NE-37252)

(DE85-002974; DOE/NE-37252/T1) Avail: NTIS HC A04/MF A01

The J-integral test was performed on HT-9 ferritic stainless steel. The fracture toughnesses of compact tension specimens of five different thicknesses were measured to investigate the thickness effects. Initially, the fracture toughness increases with specimen thickness. It increases to a maximum, then the fracture toughness decreases with specimen thickness. The measured thickness effects agree well with the model. DOE

N85-20410# California Univ., Livermore. Lawrence Livermore Lab.

SIMULATION OF BRITTLE FRACTURE VIA MOLECULAR DYNAMICS

W. G. Hoover 11 Jun. 1984 16 p refs Presented at the ISPRA EURATOM School on Computer Simulation in Phys. Met., Ispra, Italy, 21 May 1984

(Contract W-7405-eng-48)

(DE85-001061; UCRL-90905; CONF-8405247-2) Avail: NTIS HC A02/MF A01

Fast fracture in brittle materials can be simulated with molecular dynamics. The results have many features in common with macroscopic experiments on real materials. These features include at speeds comparable to the speed of sound; increasing crack velocity with increasing stress; crack inertia, allowing the penetration of cracks into regions which would not fracture under static conditions; and crack surface irregularity at moderate to high temperatures. DOE

N85-20411# Brookhaven National Lab., Upton, N. Y.

STRESS RELIEF OF TRANSITION ZONES

J. Woodward and D. vanRooyen 1984 11 p refs Presented at EPRI Steam Generator Owners Group IGA/SCC Contractors Workshop, Clearwater Beach, Fla., 27 Nov. 1984

(Contract DE-AC02-76CH-00016)

(DE85-000234; BNL-35200; CONF-8411105-1) Avail: NTIS HC A02/MF A01

Intergranular stress corrosion cracking, initiated on the primary side, in the expansion transition region of roller expanded Alloy 600 tubing is considered. It is believed that residual stresses, arising from the expansion process, are the cause of the problem. An optimal, in-situ stress relief treatment is identified. DOE

N85-20412# Argonne National Lab., Ill. Reactor Analysis and Safety Div.

THERMAL STRESS-DEPENDENT DILATION OF CONCRETE

P. A. Pfeiffer and A. H. Marchertas 1984 7 p refs Presented at Am. Nucl. Soc./ENS 1984 Intern. Conf., Washington, D.C., 11-16 Nov. 1984

(Contract W-31-109-eng-38)

(DE84-014688; CONF-841105-26) Avail: NTIS HC A02/MF A01

Nuclear fast reactor safety and the possibility of concrete containment being subjected to extremely severe environmental conditions is considered. Some of the main detrimental effects of high temperature on concrete are: reduction of strength, redistribution of moisture. Consequently, analytical prediction of concrete response under the high temperature conditions becomes very complex. A rather simple but important experiment of concrete at high temperatures was conducted by Anderberg and Thelandersson. The test samples were small so that moisture was free to evaporate with no appreciable gradient as the temperature increased. The results revealed that good correlation with analysis could be obtained if thermal expansion was made a function of both temperature and stress. The method of relating the thermal strain to temperature and stress was integrated into the TEMP-STRESS code. High temperature concrete computational capability is now available for thermal-stress calculations. DOE

N85-20413# Argonne National Lab., Ill. Reactor Analysis and Safety Div.

A NEW RHEOLOGICAL MODEL FOR CONCRETE STRUCTURAL ANALYSIS

Jenn-Chuan Chern 1984 6 p refs Presented at the Am. Nucl. Soc./ENS 1984 Intern. Conf., Washington, D.C., 11-16 Nov. 1984

(Contract W-31-109-eng-38)

(DE84-014743; CONF-841105-11) Avail: NTIS HC A02/MF A01

Long time deformation is of interest in estimating stresses of the prestressed concrete reactor vessel, in estimating stresses of the prestressed concrete vessel, in predicting cracking due to shrinkage or thermal dilatation, and in the design of leak-tight structures. Many interacting influences exist among creep, shrinkage and cracking for concrete. It is found that at simultaneous drying and loading, the deformation of a concrete structure under the combined effect is larger than the sum of the shrinkage deformation of the structure at no load and the deformation of the sealed structure. The excess deformation due to the difference between observed test data and conventional analysis is the Pickett Effect. A constitutive relation explaining the Pickett Effect, which includes creep, shrinkage (or thermal dilation), cracking, and aging was developed with an efficient time-step numerical algorithm. The total deformation in the analysis is the sum of strain due to elastic deformation and creep, cracking and shrinkage with thermal dilatation. Instead of a sudden stress reduction to zero after the attainment of the strength limit, the gradual strain-softening of concrete is considered. DOE

N85-20414# Los Alamos Scientific Lab., N. Mex. Theoretical Div.

STATISTICAL THEORY OF FRAGMENTATION PROCESSES

John K. Dienes 1984 35 p refs Presented at the Workshop on Inelastic Deformation and Failure Modes, Evanston, Ill., 18-21 Nov. 1984

(Contract W-7405-eng-36)

(DE85-002206; LA-UR-84-3173; CONF-8411109-1) Avail: NTIS HC A03/MF A01

The goal of the work reviewed here is a theory of material behavior accounting for the average deformation that results from the opening, shear, growth and coalescence of an ensemble of microcracks. A concomitant is the calculation of permeability from crack structure. The initial work on this problem made use of a linear Liouville equation to characterize the change in crack distribution resulting from crack growth and coalescence. Straightforward analytic solutions to this equation were possible because the mean free path of cracks was assumed constant. Though this assumption is useful for the early stages of crack growth, increasing crack size reduces the mean free path in the later stages of fragmentation. The governing (nonlinear) Liouville equation is derived therein, and it is shown that it can be reduced to an ordinary differential equation of third order involving only a single parameter, (BETA). This equation has now been solved numerically to determine the limiting value of the mean free path

as a function of (BETA), and the results are presented in graphical form. DOE

N85-20415# California Univ., Livermore. Lawrence Livermore Lab.
REQUIREMENTS OF QUANTITATIVE NDE IN DEVELOPING FRACTURE CONTROL PLANS
R. D. Streit 1 Nov. 1984 11 p refs Presented at the Progr. in Quantitative NDE Meeting, La Jolla, Calif., 8-13 Jul. 1984
(Contract W-7405-eng-48)
(DE85-003147; UCRL-90716; CONF-840738-12) Avail: NTIS HC A02/MF A01

The needs of the flaw size characterization in fracture control planning are described. Three factors: flaw size, flaw shape, and the probability of detection are discussed relative to linear-elastic fracture mechanics (LEFM). Three sections are presented: basics of LEFM, concepts of fracture control planning, and the requirements for flaw characterization. The same variables - flaw size, shape and probability of detection are equally important under the same constraints as with LEFM. DOE

N85-20416# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SLIT-RING TEST FOR EVALUATING FRACTURE IN TUBULAR CROSS SECTIONS
D. J. Landini, J. E. Flinn, and P. V. Kelsey, Jr. 1984 22 p refs Presented at the 37th Pacific Coast Regional Meeting of the American Ceramic Society, San Francisco, 28 Oct. 1984
(Contract DE-AC07-76ID-01570)
(DE85-003550; EGG-M-14884; CONF-841043-1) Avail: NTIS HC A02/MF A01

Slit ring specimens were used to evaluate the fracture properties of several ceramic materials produced in tubular cross sections. The utility of the specimen and its applicability to heat exchanger components is discussed. Data obtained from tests using slit ring specimens is presented and compared to data obtained using other test geometries. DOE

N85-20417# Sandia Labs., Albuquerque, N. Mex.
MINI-MODAL TESTING OF WIND TURBINES USING NOVEL EXCITATION
James P. Lauffer, Thomas G. Carne, and Arlo R. Nord 1984 8 p refs Presented at the 3rd Intern. Modal Analysis Conf., Orlando, Fla., 28 Jan. 1984
(Contract DE-AC04-76DP-00789)
(DE85-000666; SAND-84-0984C; CONF-840178-1) Avail: NTIS HC A02/MF A01

Modal testing of wind turbines can be fairly difficult because placing transducers on tall structures and providing low frequency excitation create problems. Moderate-size turbines are 100 to 200 feet tall, and their modal frequencies are very low, 0.1 to 5.0 Hz. In the mini-modal concept, only a limited number of response measurements are used in conjunction with a reasonably accurate finite element model to determine the modal parameters. Several techniques of low frequency excitation were explored, including impact, wind, step-relaxation, and human input. In tests using the mini-modal concept with human excitation, modal frequencies of large turbines have been determined in less than one day. As one application of these techniques, a prototype turbine was tested and two modal frequencies were found to be very close to integral multiples of the operating speed, which would cause a resonant condition. The design was modified to shift these frequencies, and the turbine was retested to confirm the expected changes in the modal frequencies. DOE

N85-20418 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Raumfahrttechnik.
DYNAMIC INVESTIGATIONS OF A SPHERICAL TANK STRUCTURE FILLED WITH LIQUID USING ANSYS THREE-DIMENSIONAL FLUID ELEMENTS
E. Hornung and R. Bartels 1983 51 p Presented at ANSYS Users Meetings, Munich, 15-16 Sep. 1983
(MBB-UR-E-737-83-O) Avail: Issuing Activity

The ANSYS finite element method program was used to analyze fluid motion and the behavior of a propellant management device in a bipropellant satellite tank. Modal and harmonic analysis results were compared with test data. After modification, e.g., establishment of free/free matrices of the whole structure for coupled analyses, the tests indicate that program performance is acceptable for fluid structure interactions for the global modes. The program remains unsatisfactory for local modes in axial direction. Pressure calculations require considerable hardware extensions of the CDC 176 400,000 words octal storage system. Author (ESA)

N85-20419# Sydney Univ. (Australia). School of Civil and Mining Engineering.
SIMPLIFIED THEORY FOR THE BEHAVIOUR OF BURIED FLEXIBLE CYLINDERS UNDER THE INFLUENCE OF UNIFORM HOOP COMPRESSION
I. D. Moore, I. D. Moore, and J. R. Booker Dec. 1983 48 p refs (PB85-116531; R-463) Avail: NTIS HC A03/MF A01 CSCL 13L

The elastic behavior of a long flexible cylinder buried in an infinite elastic medium and acted on by uniform hoop compressions is examined. A number of alternative solutions are developed in order to assess the influence of the component shell and continuum theories. A simplified solution is obtained, which can be used to accurately and efficiently determine the cylinder response. A straightforward method is developed for predicting the prebuckling displacements and bending moments which result from the influence of initial geometrical imperfections, nonuniform hydrostatic and nonhydrostatic field stresses. An example problem is treated to illustrate the use of the theory. Author (GRA)

N85-20819# Joint Publications Research Service, Arlington, Va.
STABILITY OF VISCOELASTIC CONSTRUCTIONS SUBJECTED TO STEADY RANDOM COMPRESSING LOADS Abstract Only
V. D. Potapov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 23 Transl. into ENGLISH from Izv. Akademii Nauk SSSR: Mekhanika Tverdogo Tela (USSR), no. 3, May-Jun. 1984 p 152-159 (For primary document see N85-20786 11-70) Avail: NTIS HC A03/MF A01

42 GEOSCIENCES (GENERAL)

N85-20420*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 4
C. F. Sechrist, Jr., ed. Apr. 1982 208 p refs
(Contract NASw-3805)
(NASA-CR-175482; NAS 1.26:175482; MAP-HANDBOOK-4) Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Topics include winter in the Northern Hemisphere, temperature measurement, geopotential heights, wind measurement, atmospheric motions, photochemical reactions, solar spectral irradiance, trace constituents, tides, gravity waves, and turbulence. Highlights from the Map Steering Committee and a Map Open Meeting including organizational structure are also given. For individual titles, see N85-20421 through N85-20433.

N85-20421*# Freie Univ., Berlin (West Germany).
PMP-1: A COORDINATED STUDY OF THE BEHAVIOR OF THE MIDDLE ATMOSPHERE IN WINTER c46
Karin Labitzke *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 8-12 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The following observations of the middle atmosphere were

available regularly: radiosonde data distributed through arrangements made by the World Meteorological Organization (WMO); radiosonde data; and the infrared radiances of the SSU (stratospheric sounding unit onboard the operational NOAA satellites). Other data of more experimental nature which are or will become available are, data from the Nimbus-7 satellite, especially from the Stratosphere and Mesospheric Sounder (SAMS) and the Limb Infrared Monitor of the Stratosphere (LIMS), but only for the winter of 1978 to 1979. These data are collected and integrated into the large-scale meteorological field analysis. Parameters necessary for the understanding of the large-scale dynamics of the middle atmosphere are derived. B.G.

N85-20422*# Kyoto Univ. (Japan). Geophysical Inst.
PMP-2: EQUATORIAL WAVE DYNAMICS **c46**
Isamu Hirota *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 13-15 refs (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

After the discovery of the quasi-biennial oscillation (QBO) in the stratospheric zonal wind, there were, in the last two decades, a large number of observational and theoretical studies on the structure and behavior of the mean zonal wind and waves in the tropical stratosphere. Planetary-scale, vertically propagating equatorial waves play an important role in producing the QBO through the mechanism of wave-mean flow interaction. Concerning the dynamics of the equatorial upper stratosphere and mesosphere, however, little was known about the possible wave motions, except for tides, mainly because of the lack of adequate observations in this region. The main purpose is to provide the nature of various types of equatorial wave modes, with the aid of improved sounding techniques and sophisticated numerical modelings. Author

N85-20423*# Centre National de la Recherche Scientifique, Verrieres-Le Buisson (France). Service Aeronomie.
FRENCH ACTIVITIES RELEVANT TO MIDDLE ATMOSPHERE RESEARCH **c46**
M. L. Chanin *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 29-33 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Interface between atomic and molecular physics and atmospheric physics; middle atmospheric research; and atmospheric exchange are discussed. Also included are proposals for research from 1982 through 1985, priorities, and available support. B.G.

N85-20424*# National Physical Lab., New Delhi (India).
MAP IN INDIA **c46**
Y. V. Somayajulu *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 39-50 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The plans for India's participation in the middle Atmosphere Program are outlined. B.G.

N85-20425*# Kyoto Univ. (Japan). Ionosphere Research Lab.
MAP IN JAPAN: ORGANIZATION AND PROJECTS **c46**
S. Kato *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 51-86 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Japan's participation in the following five map projects are discussed: (1) winds and waves; (2) constituents; (3) aerosols and radiation; (4) coordinated observations in Antarctica; and (5) data analysis and modeling. B.G.

N85-20426*# University Coll. of Wales, Aberystwyth. Dept. of Physics.
UK PARTICIPATION IN THE MIDDLE ATMOSPHERE PROGRAMME **c46**
L. Thomas *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 93-109 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Three general areas of study were identified: stratospheric composition; mesospheric and lower ionospheric structure and composition; and middle atmospheric dynamics. The role of chemical reactions and spectroscope in the study of the middle atmosphere is discussed. B.G.

N85-20427*# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
MAP-RELATED ACTIVITIES IN THE UNITED STATES **c46**
G. C. Reid *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 110-115 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Organizations in the United States which are interested in MAP participation were surveyed. Satellites, rockets, balloons, and ground support systems are listed with available experimentation. B.G.

N85-20428*# Institute of Applied Geophysics, Moscow (USSR). National Committee on Hydrometeorology and Control of the Environment.
SOVIET NATIONAL MIDDLE ATMOSPHERE PROGRAM **c46**
A. D. Danilov *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 116-137 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Soviet national MAP program comprises seven projects: lower thermosphere (structure and dynamics); high latitude energetic sources and their effect on the structure and dynamics of the upper atmosphere under conditions of the polar night; climate of the stratosphere and mesosphere (effects of various energetic sources on its formation); winter variability in the lower ionosphere; noctilucent clouds (climatology, dynamics, nature, and genesis); wave processes and structure and dynamics of the stratosphere and mesosphere; and dynamics of the ozone layer. B.G.

N85-20429*# Bonn Univ. (West Germany). Physikalisches Inst.
THE MIDDLE ATMOSPHERE PROGRAM: WINTER IN NORTHERN EUROPE (MAP/WINE) **c46**
U. vonZahn *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 139-146 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The goals of map/wind (winter in Northern Europe) are to better understand: (1) the interaction of planetary waves of tropospheric origin; (2) the temporal and spatial development of sudden stratospheric warmings; (3) the temporal and spatial development of mesospheric cooling events in conjunction with stratospheric warmings; (4) the vertical and horizontal transport of minor constituents; (5) the effects on the chemistry of neutral and charged species of the large temperature changes occurring during stratospheric warmings and mesospheric cooling; (6) sources of turbulent energy; (7) the temporal and spatial development of turbulent layers; and (8) the contributions of dynamical processes

to the heating and cooling of the mesospheric and turbopause region. B.G.

N85-20430*# National Inst. of Polar Research, Tokyo (Japan).
THE MIDDLE ATMOSPHERE PROGRAM: A SPECIAL PROJECT FOR THE ANTARCTIC MIDDLE ATMOSPHERE (AMA) c46
T. Hirasawa *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 147-151 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Areas of concern are: dynamics, structure, and atmospheric composition of the middle atmosphere in Antarctica; particle precipitation and interaction of the middle atmosphere with the lower ionosphere; atmospheric pollution; and the difference between the northern and southern polar middle atmosphere. B.G.

N85-20431*# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
INTERACTION OF LARGE METEOROIDS WITH THE ATMOSPHERE c91
Z. Ceplecha *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 153-154 refs (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

Disturbances of the atmosphere at heights of 120 to 40 km by penetration of meteroids of meter and decameter dimensions were examined. Unbiased data on atmospheric penetration of large meteroids was acquired, and their supply of gas and dust components to the middle atmosphere and their connection with the noctilucent clouds were determined. B.G.

N85-20432*# Kharkovskii Inst. Radioelektroniki (USSR).
THE GLOBAL METEOR OBSERVATION SYSTEM (GLOBMET) c91
B. L. Kashcheev *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 155-160 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

The main objective is to prepare for and conduct meteor research on the basis of experimental data models of atmospheric circulation, the influx and distribution of meteor substance in the near space, and models of meteor-to-atmospheric interaction. B.G.

N85-20433*# Uppsala Ionospheric Observatory (Sweden).
COLD ARCTIC MESOPAUSE PROJECT (CAMP): SCIENTIFIC OBJECTIVES c46
L. Bjorn *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 161-164 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

During late summer 1978 a rocket campaign was carried out at Esrange. The ion chemistry and composition at and around the extremely cold arctic mesopause, particularly in connection with observations of noctilucent clouds (NLC) was studied. Several plasma parameters were measured, for example, density of electrons and positive ions and composition of both positive and negative ions. B.G.

N85-20434*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 5
C. F. Sechrist, Jr., ed. May 1982 194 p refs Sponsored in part by UNESCO and WMO
(Contract NASw-3805)
(NASA-CR-175481; NAS 1.26:175481; MAP-HANDBOOK-5) Avail: NTIS HC A09/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The variability of the stratosphere during the winter in the Northern Hemisphere is considered. Long term monthly mean 30-mbar maps are presented that include geopotential heights, temperatures, and standard deviations of 15 year averages. Latitudinal profiles of mean zonal winds and temperatures are given along with meridional time sections of derived quantities for the winters 1965/66 to 1980/81. For individual titles, see N85-20435 through N85-20435.

N85-20435*# Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
A CATALOGUE OF DYNAMIC PARAMETERS DESCRIBING THE VARIABILITY OF THE MIDDLE STRATOSPHERE DURING THE NORTHERN WINTERS c82
K. Labitzke and B. Goretzki *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 5 May 1982 31 p refs Sponsored by the Deutsche Forschungsgemeinschaft (For primary document see N85-20434 11-42)
Avail: NTIS HC A09/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 05B

The international variability of the middle stratosphere during the winter in the Northern Hemisphere is discussed. Monthly mean temperatures over the North Pole are presented along with charts of mean zonal wind velocities at 60 deg N. R.S.F.

N85-20436*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 6
C. F. Sechrist, Jr., ed. Nov. 1982 112 p
(Contract NASw-3646)
(NASA-CR-175480; NAS 1.26:175480; MAP-HANDBOOK-6) Avail: NTIS HC A06/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

A directory of scientists associated with the Middle Atmosphere Program (MAP) is presented. The MAP steering committee, the standing committees, MAP study groups, and MAP projects are mentioned along with the MAP secretariat and regional consultative group. R.S.F.

N85-20437*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 7
C. F. Sechrist, Jr., ed. Dec. 1982 157 p refs Sponsored in part by WMO and UNESCO
(Contract NASw-3646)
(NASA-CR-175479; NAS 1.26:175479; MAP-HANDBOOK-7) Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Completed and proposed research relating to the Middle Atmosphere Program is discussed. Emphasis is given to the winters in the Northern Hemisphere, the equatorial atmosphere, meteor observation, solar irradiance, atmospheric temperature, geopotential height, atmospheric circulation, and electrodynamics. For individual titles, see N85-20438 through N85-20444.

N85-20438*# Georgia Inst. of Tech., Atlanta.
GLOBAL METEOR OBSERVATION SYSTEM (GLOBMET) c91
Robert G. Roper *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 21-33 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

The principal scientific objectives and main methodological

problems of the global meteor observation system are enumerated. Observational methods and the setting up of an observational network are discussed. Data requirements and international data exchange are addressed. R.S.F.

N85-20439*# Bonn Univ. (West Germany).
WINTER IN NORTHERN EUROPE (WINE) PROJECT c47
U. vonZahn *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 42-53 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The scientific aims, work plan, and organization of the Middle Atmosphere Program winter in northern Europe (MAP/WINE) are described. Proposed contributions to the MAP/WINE program from various countries are enumerated. Specific atmospheric parameters to be examined are listed along with the corresponding measurement technique. R.S.F.

N85-20440*# National Physical Lab., New Delhi (India).
MAP ACTIVITIES IN HUNGARY c46
P. Bencze *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 65-73 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The scientific objectives and the experiments and observations of the Indian Middle Atmosphere Program are discussed. Specific objectives and studies relate to the following topics: (1) atmospheric radiation; (2) atmospheric dynamics; (3) atmospheric chemistry; (4) atmospheric ionization and electrodynamics; (5) atmospheric models; and (6) atmospheric circulation. R.S.F.

N85-20441*# Freie Univ., Berlin (West Germany).
PMP-1 REPORT: THE FOURTH WINTER OF PMP-1, 1981 - 1982: A WINTER WITH SEVERAL INTERESTING FEATURES c47
Karin Labitzke *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 79-89 refs (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

A synoptic description is given for the fourth winter of pre-MAP project 1 (PMP-1), 1981/82. The main characteristics of this winter are a Canadian warming in the beginning of December, a very strong minor warming in January, and an early final warming in mid-March. The eddy momentum budget, calculated from the daily height and temperature charts, is discussed in terms of the divergence of the Eliassen-Palm-vector. Author

N85-20442*# Kyoto Univ. (Japan).
PMP-2 REPORT: EQUATORIAL WAVE DYNAMICS c46
Isamu Hirota *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 90-93 refs (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The activities of the pre-MAP project 2 (PMP-2) from 1978 through 1981 are described. The following topics relating to the equatorial middle atmosphere are discussed briefly: (1) the semi-annual oscillation and Kelvin waves; (2) planetary Rossby waves; (3) upper mesospheric waves; and (4) gravity waves. R.S.F.

N85-20443*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MSG-7: ATMOSPHERIC PENETRATION OF SOLAR RADIATION IN THE RANGE OF SCHUMANN-RUNGE BANDS c46
J. E. Frederick *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 94 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

There have been major efforts in measuring extraterrestrial solar irradiance for use in atmospheric studies. The quantity of immediate relevance to theoretical studies is the number of photons which reach a given altitude in the middle atmosphere. Current models compute the attenuated radiation field but the cross sections available for the major absorbers, O2 and O3, often come from experiments that are now quite old. Balloon measurements show some significant differences between the predicted and observed ultraviolet radiation field between 30 and 40 km. The wavelength region to be studied includes Lyman alpha plus the range 175 nm to the visible. Specific topics to be addressed are as follows: (1) the cross sections of the major absorbers, O2 and O3 including the Schumann-Runge bands as a subset; (2) comparison of the in situ measurements of the attenuated radiation field with calculations; and (3) the relevance of the scattered and reflected radiation fields for middle atmospheric processes. R.S.F.

N85-20444*# National Center for Atmospheric Research, Boulder, Colo.
WORKSHOP ON COMPARISON OF DATA AND DERIVED DYNAMICAL QUANTITIES DURING NORTHERN HEMISPHERE (PMP-1) WINTERS c46
J. C. Gille and Karin Labitzke (Freie Univ., Berlin, West Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 95-100 Workshop held in Boulder, Colo., 11-14 May 1982 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Atmospheric temperature and geopotential height were compared along with the quantities derived from them for application to stratospheric dynamics. The data for comparison were those gathered from radiosondes and rockets. Data from the Northern Hemisphere winters 1978/79 through 1981/82 were discussed, but most attention was devoted to days during the winter of 1978/79. R.S.F.

N85-20445*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 8
C. F. Sechrist, Jr., ed. Jul. 1983 79 p refs Sponsored in part by UNESCO
(Contract NASw-3646)
(NASA-CR-175478; NAS 1.26:175478; MAP-HANDBOOK-8) Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Various investigations relative to middle atmosphere research are discussed. Atmospheric warming periods in 1982-83, atmospheric composition, the comparison of irradiance measurement calibration, and molecular absorption processes related to the penetration of ultraviolet solar radiation into the middle atmosphere, are among the topics discussed. For individual titles, see N85-20446 through N85-20449.

N85-20446*# Freie Univ., Berlin (West Germany).
THE FIRST WINTER OF MAP-DYNAMICS, 1982-1983: A WINTER WITH THREE DIFFERENT WARMING PERIODS c47
Barbara Naujokat, Karin Petzoldt, Karin Labitzke, and Renate Lenschow *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 1-15 refs (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

A synoptic description is given for the first winter of the Middle Atmosphere Program's atmospheric dynamics efforts for 1982-83. After a cold early winter period three warming periods were observed at the end of December, the end of January, and the end of February. In March a pronounced late winter cooling occurred in the upper stratosphere, whereas in the lower levels the final warming started slowly, but was not accomplished before mid-April. The momentum budget, calculated from the daily height and temperature charts, is discussed in terms of the divergence of the Eliassen-Palm-Vector. R.J.F.

N85-20447*# Wuppertal Univ. (West Germany).
MAP/GLOBUS CAMPAIGN 1983 **c46**
D. Offerman *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 17-43 refs (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The major scientific objectives of the campaign are the accurate measurement of ozone and its short-term variability together with the determination of members of the NO sub x family as NO, NO2, NO3, N2O5, and HNO3. Related important solar fluxes (including scattered fluxes) shall be measured as much as possible. Other important trace species (as H2O) shall be determined simultaneously. The detailed scientific objectives for the ozone and NO sub x measurements are given. A further scientific objective is the study of atmospheric dynamics, especially of the meteorological background. Therefore special analysis will be performed of the data of respective network stations and satellites. Local wind and turbulence measurements will also be performed. R.J.F.

N85-20448*# Institut d'Aeronomie Spatiale de Belgique, Brussels.
REPORT ON THE WORKSHOP ON INTERCOMPARISON OF SOLAR UV IRRADIANCE MEASUREMENTS AND RELATED INSTRUMENT CALIBRATION **c92**
P. C. Simon *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 45-51 ref (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

The knowledge of the absolute value of the solar ultraviolet irradiance did not improve very much during the rising phase of the solar cycle 21. The variations associated with the solar rotation period were observed by means of three satellites, namely, the Atmospheric Explorer E (AE-E), Nimbus 7 and the Solar Mesospheric Explorer (SME). Long-term variations related to the solar activity cycle are not well known. Values were deduced during the solar cycle 21 from the AE-E satellite and the rocket program performed by the Laboratory for Atmospheric and Space Physics leading to variations of about a factor of 2 around 150 nm but definitely less than 20 percent beyond 175 nm. Such low level of variation is still masked by the current uncertainties and reproducibility of the observations performed since 1976. The uncertainties of recent observations are reported with their discrepancies. The gaps between the current accuracy goals and the achievements are still very important. The challenge for the next three years is to improve both the accuracy and the precision of future observations at the level of the available irradiance standards and to measure quantitatively long-term variations of the order of a few percent. The main causes of these gaps are identified. R.J.F.

N85-20449*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MSG-7: MOLECULAR ABSORPTION PROCESSES RELATED TO THE PENETRATION OF ULTRAVIOLET SOLAR RADIATION INTO THE MIDDLE ATMOSPHERE **c46**
J. E. Frederick, A. J. Blake (Adelaide Univ.), D. E. Freeman (Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.), R. W. Nicholls (York Univ., Downsview, Ontario), T. Ogawa (Kyoto Univ.), and P. C. Simon (Inst. d'Aeronomie Spatiale de Belgique) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 53-74 refs (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The information presently available on the absorption cross sections of O2 and O3 with attention to the application of these data in middle atmospheric science is reviewed. The cross sections values reported by different groups are intercompared in tabular form where feasible, and specific values are recommended when there is a basis for preferring a particular set of results over other available data. When no such basis exists, the differences among published cross sections then serve to indicate a range of uncertainty. In these cases the need for additional work is indicated. Specific topics addressed are the absorption of molecular oxygen at Lyman alpha, in the Schumann-Runge continuum, in the Schumann-Runge bands, and in the Herzberg continuum. For ozone, the Hartley and Huggins bands are considered. R.J.F.

N85-20450*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 10
J. Taubenheim, ed. May 1984 229 p refs Proc. of the Intern. Symp. on Ground-Based Studies of the Middle Atmosphere, Schwerin, East Germany, 9-13 May 1983
(Contract NASw-3805)
(NASA-CR-175477; NAS 1.26:175477; MAP-HANDBOOK-10)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The contributions of ground based investigations to the study of middle atmospheric phenomena are addressed. General topics include diagnostics of the middle atmosphere from D region properties, winter anomaly, seasonal variations and disturbances, dynamics and theoretical models, ground based tracking of winds and waves, lower thermosphere phenomena, and solar-terrestrial influences. For individual titles, see N85-20451 through N85-20491.

N85-20451*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar-Terrestrial Physics.
NEUTRAL ATMOSPHERE PROPERTIES DETERMINING D-REGION ELECTRON DENSITIES **c46**
J. Taubenheim *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 1-5 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The increasing discoveries of various manifestations of meteorological control of the D region ionization and the growth of techniques for its measurement provide a challenge to meteorologists to test their insight into middle atmosphere processes with the physical interpretation of D layer phenomena. Models for ion production due to photoionization of minor atmospheric nitric oxide by quasi-monochromatic solar Lyman-alpha radiation are presented. A ground based measuring technique using low frequency radio reflection heights is briefly described and an approach to the interpretation of data acquired by this method is discussed. It is shown that D region electron density variations can provide an efficient diagnostic tool for the detection of perturbations of the circulation state of the middle atmosphere. M.G.

N85-20452*# Technische Univ., Graz (Austria). Dept. of Communications and Wave Propagation.
VARIATION OF DERIVED MESOSPHERIC NITRIC OXIDE IN RELATION TO WIND AND TEMPERATURE IN WINTER **c45**
M. Friedrich and K. M. Torkar *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 6-15 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 13B

As a good approximation, changes of the NO-density are solely responsible for changes of the non-auroral D-region. Under the assumption that other ion production processes are either known or negligible, one can derive (NO) from electron densities using a suitable effective electron loss rate. In the Winter Anomaly Campaign 1975/76 nineteen rocket payloads carried electron density measurements on fifteen days. On two of these days (NO) was measured in-situ by photometers. For these days one can establish the production not due to Lyman-alpha and NO. This rest production can then be applied to all (NO) derivations based on electron density measurements. In addition, in this campaign winds and temperatures were measured from the ground to approximately the base of the thermosphere. The derived field of NO densities between December 1975 and February 1976 from 70 to 100 km is compared to corresponding fields of winds (zonal and meridional), temperatures, pressure and Richardson numbers. M.G.

N85-20453*# Institute of Applied Geophysics, Moscow (USSR).
MIDDLE ATMOSPHERE TEMPERATURE AND DYNAMICS AS REVEALED FROM D-REGION OBSERVATIONS **c46**
A. D. Danilov *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 16-23 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The concept of so-called meteorological control of the ionospheric D-region is presently undergoing development. According to this concept the electron concentration in this region is governed not only by solar and geomagnetic parameters but strongly depends on the temperature and dynamical regime of the mesosphere and stratosphere. How this connection between D-region and meteorological parameters can be used to obtain some information about middle atmosphere temperature and dynamics is examined. The essential points of the meteorological control concept are reviewed and the influence of turbulence on nitric oxide distribution and thus the ion production rate is discussed. M.G.

N85-20454*# Technische Univ., Graz (Austria). Space Research Inst.
SYNOPSIS OF MID-LATITUDE RADIO WAVE ABSORPTION IN EUROPE **c32**
K. M. Torkar and M. Friedrich *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 24-30 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 20N

Radio wave absorption data covering almost two years from Europe to Central Asia are presented. They are normalized by relating them to a reference absorption. Every day these normalized data are fitted to a mathematical function of geographical location in order to obtain a daily synopsis of radio wave absorption. A film of these absorption charts was made which is intended to reveal movements of absorption or absorption anomaly. In addition, radiance (temperature) data from the lower D-region are also plotted onto these charts. Author

N85-20455*# Ceskoslovenska Akademie Ved, Prague. Geophysical Inst.
IONOSPHERIC ABSORPTION ON 1539 kHz IN RELATION TO SOLAR IONIZING RADIATION **c92**
J. Boska *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 31-33 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

Radio wave absorption data on 1539 kHz for the summer period of 1978 to 1980 are considered in relation to variations of solar X-ray and L-alpha radiation. It is shown that under non-flare conditions L-alpha dominates in controlling absorption and that X-rays contribute about 10% to the total absorption. Optimum regression equations show that absorption is proportional to the m-th power of ionizing flux where $m < 1$. The role of correcting L-alpha values, measured by the AE-E satellite, is discussed. Author

N85-20456*# Academy of Sciences, Kuhlungsborn (East Germany). Central Inst. of Solar Terrestrial Physics.
INDIRECT PHASE HEIGHT MEASUREMENTS IN CENTRAL AND EASTERN EUROPE FOR MONITORING D REGION PLASMA **c46**
G. V. Cossart and S. V. Pakhomov (Inst. of Applied Geophysics, Dolgeprudny, USSR) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 34-38 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Low-frequency propagation experiments for the investigation of the lower part of the ionospheric D region were at first used by BRACEWELL et al. (1951) in the early fifties. Among these was the method of indirect phase height measurements for continuous monitoring of the lower ionosphere. It is based upon field strength measurements of commercial radio transmitters in the frequency range between 50 and 200 kHz at distances from 500 to 1500 km. The field strength records show characteristic diurnal variations with maxima and minima, produced by interference between the ground wave and the ionospherically reflected sky wave, the phase difference between varies in correspondence to the diurnal variation of the reflection height. In order to check the validity of interpretations of indirect phase height data, comparisons were made with simultaneous rocket soundings. Results are summarized. M.G.

N85-20457*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar Terrestrial Physics.
MEASUREMENTS OF PARTIAL REFLECTIONS AT 3.18 MHz USING THE CW RADAR TECHNIQUE **c32**
J. Priese and W. Singer *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 39-44 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 17I

An equipment for measuring partial reflections using the FM-CW-radar principle at 3.18 MHz, installed at the Ionospheric Observatory Juliusruh of the CISTP (HHI), is described. The linear FM-chirp of 325 kHz bandwidth is Gaussian-weighted in amplitude and gives a height resolution of 1.5 km (chirp length is 0.6 sec). Preliminary results are presented for the first observation period in winter 1982/83. Author

N85-20458*# Instituto Nacional de Tecnica Aeroespacial, Huelva (Spain).
ABNORMAL CIRCULATION CHANGES IN THE WINTER STRATOSPHERE, DETECTED THROUGH VARIATIONS OF D REGION IONOSPHERIC ABSORPTION **c46**
B. A. delaMorena *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 45-51 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

A method to detect stratospheric warmings using ionospheric absorption records obtained by an Absorption Meter (method A3) is introduced. The activity of the stratospheric circulation and the D region ionospheric absorption as well as other atmospheric parameters during the winter anomaly experience an abnormal

variation. A simultaneity was found in the beginning of abnormal variation in the mentioned parameters, using the absorption records for detecting the initiation of the stratospheric warming. Results of this scientific experience of forecasting in the El Arenosillo Range, are presented. B.W.

N85-20459*# Academy of Sciences (USSR), Troitsk. Inst. of Terrestrial Magnetism.

WINTER ANOMALY OF THE LOWER IONOSPHERE AND ITS POSSIBLE CAUSES **c46**

Z. Ts. Rapoport *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 52-57 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

It is a well-known fact that in winter the midlatitude lower ionosphere differs considerably from that in summer. Attempts to explain the possible causes of the winter anomaly in the lower ionosphere were made. Integrated ground-based and rocket experiments were performed in the USSR. The rockets M-100B launched in Volgograd (psi = 48.7 deg N; lambda = 44.3 deg E; psi = 43.1 deg) provided weight profiles of electron density, wind and temperature. Radio wave absorption data obtained by a I method in Volgograd and F sub min parameters values obtained at a number of Soviet ionosone stations were used to determine the situation in the lower ionosphere. It was found that a correct interpretation of the midlatitude winter radio wave absorption changes is possible only if the whole spatial-time pattern of the event is taken into account. B.W.

N85-20460*# Geophysical Observatory, Sodankyla (Finland).

AUTUMN AND WINTER ANOMALIES IN IONOSPHERIC ABSORPTION AS MEASURED BY RIOMETERS Abstract Only **c46**

H. Ranta *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 60-61 (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Seasonal variations of ionospheric absorption were studied using riometer (A2) measurements over a wide latitude range. In agreement with the results of earlier studies of A1 radiowave absorption, equinoctial maxima of approximately .equal amplitude are observed in the auroral zone and near the equator. However, at intermediate latitudes riometer absorption maximizes during the fall season, whereas the A1 data show a semi-annual variation with maxima occurring in summer and winter. The autumn anomaly in riometer absorption is observed at much higher geographic latitude in the Southern Hemisphere, but at comparable geomagnetic latitudes in both hemispheres. The winter anomaly was seen only in absorption values calculated at constant solar zenith angle. Author

N85-20461*# Ceskoslovenska Akademie Ved, Prague. Geophysical Inst.

WINTER ANOMALY 1982/83 IN COMPARISON WITH EARLIER WINTERS (1960-82) **c46**

J. Lastovicka *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 62-65 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The winter anomaly in the winter of 1982/83 is compared with the winter anomalies of earlier winters (1960-82) from the point of view of amplitude and timing of the winter anomaly, and geomagnetic and dynamic activity influences. Some evidence of a negative influence of sudden stratospheric warnings on the winter anomaly is given. Author

N85-20462*# Bulgarian Academy of Science, Sofia. Geophysical Inst.

A MODEL OF THE INFLUENCE OF NEUTRAL AIR DYNAMICS ON THE SEASONAL VARIATION IN THE LOW IONOSPHERE **c47**

G. Nestorov, P. J. Velinov, and T. Pancheva *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 66-69 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Recently it has become clear that the phenomena in the ionospheric D-region are determined to a great extent by dynamical processes in the strato-mesosphere D-region. In this respect much attention is paid to the study of the winter anomaly (WA) phenomenon on medium and short radiowaves, in which the meteorological character of the lower ionosphere is most prominent. Significant experimental data about the variations of the electron concentration, N, ion composition, temperature and dynamic regime during WA permit a better understanding of the character of the physical processes in the middle atmosphere. The influence of the neutral wind on the seasonal variation of the electron concentration N for the altitude interval 90 < or = z < or = 120 km, where the ratio upsilon sub in/omega sub i, of the ion-neutral collision frequency, upsilon sub in and the ion gyrofrequency, omega sub i decreases from 40 to 1 was evaluated. CIRA-72 is used as a model of the zonal wind. B.W.

N85-20463*# Bulgarian Academy of Science, Sofia. Geophysical Inst.

EXPLANATION OF THE NORMAL WINTER ANOMALY FROM THE SEASONAL VARIATION OF SHORT WAVE ABSORPTION **c32**

P. J. Velinov, N. V. Smirnova (Academy of Sciences (USSR), Murmansk), and V. A. Vlaskov (Academy of Sciences (USSR), Murmansk) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 70-74 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 20N

The frequency dependence of the winter anomaly (WA) of radio wave absorption indicates the altitude range where the considered seasonal variation of absorption, L, takes place: 75-95 km. In this height region considerable seasonal variations of ionic composition and effective recombination coefficient, alpha sub e, exist, which can cause seasonal variations of electron concentration, N, and absorption, L. An attempt to render a qualitative estimation of the normal WA, i.e., the increased ratio of winter over summer absorption, L sub w/L sub s, at medium latitudes 40 deg and 50 deg, for solar zenith angles CHi = 60 deg and 75 deg is made. This is compared with existing experimental data. B.W.

N85-20464*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionospheric Research.

SEASONAL CHARACTERISTICS OF MESOSPHERIC PLASMA AND THEIR TRANSITIONS **c46**

E. A. Lauter *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 75-78 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The main seasonal features of the middle atmosphere are arising from the different dynamical basic states in winter and summer. The development of the two controversial circulation systems and the also different peculiarities of transition between them in spring and autumn create the completely dominant seasonal variations in strato- and mesosphere. Even in the plasma structures of the mesospheric D-region the seasonal variation is towering above the amplitudes of extraterrestrial influences. From

standard ionospheric sounding, significant seasonal D- and E-region effects, adhering to equally significant structure changes in the neutral gas in the height region from 20 to 100 km were discovered. Results about such typical seasonal features are summarized. B.W.

N85-20465*# Freie Univ., Berlin (West Germany). Meteorological Inst.

MIDWINTER DISTURBANCES IN THE MIDDLE ATMOSPHERE c46

K. Labitzke *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 79-85 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The Middle Atmosphere is coupled to the troposphere during winter because planetary scale waves can propagate upwards if the prevailing winds are from the west. It is during this time of the year that the well-known midwinter disturbances are observed which ultimately affect the whole of the Middle Atmosphere. The mechanism of these disturbances is not completely understood. The large-scale circulation features up to the upper mesosphere are investigated to demonstrate the synoptic-scale behavior of the midwinter disturbances. Ground-based and satellite observations are combined. The interannual variability of the disturbances is discussed briefly. It is shown that the QBO (Quasi Biennial Oscillation) of the equatorial stratosphere appears to modulate the planetary waves during the northern winters, in the troposphere as well as in the Middle Atmosphere. B.W.

N85-20466*# Academy of Sciences, Kuhlungsborn (East Germany). Central Inst. of Solar Terrestrial Physics.

SPRING CHANGEOVER OF THE MIDDLE ATMOSPHERE CIRCULATION COMPARED WITH ROCKET WIND DATA UP TO 80 km c47

G. Entzian, D. A. Tarasenko (Inst. of Applied Geophysics, Dolgoprudny, USSR), and E. A. Lauter *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 86-90 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

The middle atmosphere circulation is governed by two seasonal basic states in winter and summer, twice a year separated by relatively shortlived reversal periods. These seasonal basic states of circulation and the spring changeover period between them are investigated. B.W.

N85-20467*# Academy of Sciences, Kuhlungsborn (East Germany). Central Inst. of Solar Terrestrial Physics.

LARGE SCALE WINTER TIME DISTURBANCES IN METEOR WINDS OVER CENTRAL AND EASTERN EUROPE c46

K. M. Greisiger, Yu. I. Portnyagin (Inst. of Applied Geophysics, Obninsk, USSR), and I. A. Lysenko (Inst. of Applied Geophysics, Obninsk, USSR) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 91-95 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Daily zonal wind data of the four pre-MAP-winters 1978/79 to 1981/82 obtained over Central Europe and Eastern Europe by the radar meteor method were studied. Available temperature and satellite radiance data of the middle and upper stratosphere were used for comparison, as well as wind data from Canada. The existence or nonexistence of coupling between the observed large scale zonal wind disturbances in the upper mesopause region (90 to 100 km) and corresponding events in the stratosphere are discussed. R.S.F.

N85-20468*# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).

VHF RADAR OBSERVATIONS IN THE STRATOSPHERE AND MESOSPHERE DURING A STRATOSPHERIC WARMING Abstract Only c46

R. Ruster, P. Czechowsky, G. Schmidt, and K. Labitzke (Freie Univ., Berlin, West Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 96 Submitted for publication (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The SOUSY-VHF-radar was used to carry out measurements during minor and a major stratospheric warming in February and March 1980, respectively. Echoes have been received from the stratosphere up to an altitude of about 30 km continuously during day and night, whereas echoes from the mesosphere were restricted to the daytime and occurred sporadically at different heights within the altitude range from 60 to 90 km. The three dimensional velocity vector was derived from Doppler measurements made in three different antenna beam directions with a height resolution of 1.5 km. In particular, the results obtained during disturbed conditions show the change of the zonal winds at mesospheric heights from westerly to easterly. A spectral analysis reveals a diurnal and a weaker semidiurnal tide of the zonal wind component. Author

N85-20469*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionosphere Research.

CHANGES IN THE OZONE CONTENT OVER CENTRAL EUROPE DURING REVERSALS OF STRATOSPHERIC CIRCULATION IN LATE WINTER c47

G. Entzian and K. H. Grasnick (Meteorological Service, Potsdam, East Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 97-100 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

A superposed epoch analysis during late winter zonal wind reversals was carried out from 18 year observation series (1963 to 1980) of the meridional geopotential height gradient in the 30 mb level (latitude mean) and of the ozone content over central Europe. Experimental data suggest that if planetary waves are responsible for the additional meridional ozone transport during stratospheric warmings, this transport has to take place at heights other than those up to the ozone maximum in the middle latitudes. R.S.F.

N85-20470*# Institute of Applied Geophysics, Moscow (USSR).

SOME ASPECTS OF GENERAL CIRCULATION AND TIDES IN THE MIDDLE ATMOSPHERE c46

A. I. Ivanovskiy *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 101-109 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Data from several sources suggest that between 100 and 200 km in the middle atmosphere, a layer of anomalous circulation must be situated, at least in middle latitudes. The mechanisms responsible for the circulation anomaly in this height region are discussed in terms of hydrodynamic equations. The current state of atmospheric tidal theory is also addressed. R.S.F.

N85-20471*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionosphere Research.

ASPECTS OF PLANETARY WAVE TRANSPORTS IN THE MIDDLE ATMOSPHERE c46

G. Schmitz *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 110-115 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP

Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The heat and momentum flux due to standing planetary waves in the stratosphere were calculated on the basis of satellite data. The convergence of these fluxes was investigated and shows an apparent heating and acceleration of the mean zonal state. The Eliassen-Palm flux divergence calculation shows that the mean zonal state is effectively decelerated. Furthermore, the interaction between ultra long waves and k = 4 - 15 in the troposphere was investigated for a winter period and is discussed in connection with the geopotential wave one amplitude, which increases before a stratospheric warming event occurs. R.S.F.

N85-20472*# Institut d'Aeronomie Spatiale de Belgique, Brussels.
COUPLING BETWEEN THE THERMOSPHERE AND THE STRATOSPHERE: THE ROLE OF NITRIC OXIDE c46
G. Brasseur *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 116-121 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

In order to understand the lower ionosphere and its probable control by dynamical processes, the behavior of nitric oxide below 100 km was investigated. A two dimensional model with coupled chemical and dynamical processes was constructed. Calculations based on the model reveal that the chemical conditions at the stratopause are related to the state of the thermosphere. This coupling mechanism can be partly explained by the downward transport of nitric oxide during the winter season, and consequently depends on the dynamical conditions in the mesosphere and in the lower thermosphere (mean circulation and waves). In summer, the photodissociation of nitric oxide plays an important role and the thermospheric NO abundance modulates the radiation field reaching the upper stratosphere. Perturbations in the nitric oxide concentration above the mesopause could therefore have an impact in the vicinity of the stratopause. R.S.F.

N85-20473*# Ondrejov Observatory (Czechoslovakia).
ATMOSPHERIC PROFILE IMPRINT IN FIREWALL ABLATION COEFFICIENT c46
Z. Ceplecha and P. Pecina *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 122-126 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

A general formula which expresses the distance along the meteoric fireball trajectory 1 as a function of t is discussed. Differential equations which include the motion and ablation of a single nonfragmenting meteor body are presented. The importance of the atmospheric density profile in the meteor formula is emphasized. R.S.F.

N85-20474*# Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
METEOR WIND RESULTS FROM ATLANTA, USA, AND RAMEY, PUERTO RICO c47
R. G. Roper *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 127-133 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

Results obtained using the French (CNET) meteor wind radar at Ramey, Puerto Rico, and the Georgia Tech radio meteor wind facility in Atlanta, U.S.A., are presented and compared. Prevailing wind, diurnal, and semidiurnal wind amplitudes are considerably larger over Ramey than over Atlanta, but the mean zonal circulation over Atlanta is more characteristic of the equatorial circulation than winds measured by stations at higher midlatitudes. The value of continuous observations, with a height resolution of + or - 2 km, is emphasized, as is the need for the application of several techniques, groundbased, in situ and satellite, if projects such as the MAP GLOBMET are to succeed in delineating the global meteorology of the mesopause. Author

N85-20475*# Institute of Experimental Meteorology, Obninsk (USSR).
BASIC FEATURES OF GLOBAL CIRCULATION IN THE MESOPAUSE LOWER THERMOSPHERE REGION c46
Yu. I. Portnyagin *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 134-142 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

D1 and D2 techniques have been used and are being used for observations at stations located in the high, middle, and low latitudes of both hemispheres. The systematical and wind velocity measurements with these techniques make it possible to specify and to refine earlier mesopause-lower thermosphere circulation models. With this in view, an effort was made to obtain global long term average height-latitude sections of the wind field at 70 to 110 km using the analysis of long period D1 and D2 observations. Data from 26 meteor radar and 6 ionospheric stations were taken for analysis. R.S.F.

N85-20476*# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.
WINDS AND WAVES (4 MIN - 11 YRS) IN THE UPPER MIDDLE ATMOSPHERE (60-110 km) AT SASKATOON, CANADA (52 DEG N, 107 DEG W): MF RADAR (2.2 MHz) SOUNDINGS 1973 - 1983 c46
A. H. Manson, C. E. Meek, and J. B. Gregory *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 143-151 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Examples of gravity waves (GW), tides, planetary waves (PW), and circulation effects in the upper middle atmosphere are presented. Energy densities of GW, tides, and PW are compared. Fourier and spectral analyses are applied to the data. R.S.F.

N85-20477*# Academy of Sciences (USSR), Irkutsk. Inst. of Terrestrial Magnetism.
THE DYNAMICS OF IONOSPHERIC D REGION OVER EAST SIBERIA c46
E. S. Kazimirovsky *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 152-159 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Some main results of experimental investigations of the dynamical regime of the ionospheric D-region over East Siberia are presented. Regular measurements of horizontal ionospheric drifts by the radio method of closely spaced receivers, using a long wavelength transmitter operating at a frequency of 200 kHz, were carried out near Irkutsk, USSR, since 1975. The seasonal and inter-annual variations of prevailing wind (zonal and meridional), and amplitudes and phases of semi-diurnal tides are investigated. Evidence is presented to show the response of D-region dynamics to stratospheric warmings. Planetary and gravity waves are found in the wind field. Comparison with results of analogous measurements in Central Europe (Collm, GDR) reveals a longitudinal effect on the dynamical regime of the mid-latitude lower thermosphere. R.J.F.

N85-20478*# Leipzig Univ. (East Germany). Dept. of Physics.
MEASUREMENT OF THE VERTICAL GRADIENT OF THE SEMI-DIURNAL TIDAL WIND PHASE IN WINTER AT THE 95 km

LEVEL c46

R. Schminder and D. Kurschner *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 160-164 (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

When supplemented by absolute reflection height measurements, low frequency wind measurements in the 90-100 km height range become truly competitive in comparison with the more widely used radar meteor wind observations. For example, height profiles of the wind parameters in the so-called meteor zone can be obtained due to the considerable interdiurnal variability of the average nighttime reflection heights controlled by geomagnetic activity. The phase of the semidiurnal tidal wind is particularly height-dependent. The measured vertical gradient of 1/4 h/km in winter corresponds to a vertical wavelength of about 50 km. Wind measurements in the upper atmosphere, at heights between 90 and 100 km, were carried out at the Collm Geophysical Observatory of Karl Marx University Leipzig for a number of years. These measurements use the closely-spaced receiver method and three measuring paths, on 179, 227, and 272 kHz. They take place every day between sunset and sunrise, i.e., nightly. A night in this sense may last as long as 18 hours in winter. Both the measurements and their evaluation are completely automatic, and the prevailing winds and tides are separated. R.J.F.

N85-20479*# Academy of Sciences (USSR), Irkutsk. Inst. of Terrestrial Magnetism.

STRATWARM EFFECTS IN THE IONOSPHERIC D REGION WIND FIELD c46

G. V. Vergasova *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 166-170 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

An analysis is made of the wind field structure in the stratothermosphere over Eastern Siberia during the winter stratwarms of 1975-1977. It is found that coupling between dynamical processes in the stratosphere and lower thermosphere is effected through changes of the temperature regime of the atmosphere. The circulation regime both in the stratosphere and lower thermosphere depends on location of the source of perturbations that cause stratospheric warmings. The effect of warming-induced perturbations on the dynamics of above- and underlying layers and the meridional extent of the processes are determined by the altitude and region where anti-cyclones originate. In conditions of a warmer stratosphere, there is a considerable loss of wind stability in the ionospheric D-region. A time delay of 1 to 2 days of lower-thermosphere processes is found to occur with respect to stratospheric processes of temperature variation at 30 mb level. Author

N85-20480*# Academy of Sciences (USSR), Moscow. Inst. of Physics of the Atmosphere.

OROGRAPHIC DISTURBANCES OF UPPER ATMOSPHERE EMISSIONS c46

N. N. Shefov and N. N. Pertsev *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 171-175 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

There are some increases of the temperature of the hydroxyl emission (delta T approximately 20 K, z approximately 90 km) and of the intensity of the 63000 oxygen emission (delta I/I approximately 20 per cent, z approximately 250 km) for the lee of the mountains at distances about 150 km in the case of the latitudinal direction of the wind (U approximately 10 m/s) at the 3000 m level. Airflow motions over mountains may be one of the possible processes of generation of wave disturbances penetrating into the upper atmospheres (HINES, 1974; LINDZEN, 1971). The purpose here is to study the penetration of orographic disturbances into upper atmosphere. Airplane measurements of emission variations of hydroxyl and atomic oxygen 6300 A near the Northern Ural mountains were made. Several nocturnal flights were carried out in March, 1980 and January to February, 1981 at heights about 3000 m along 64 deg northern latitude in the Ural region. Spectrographs SP-48 with electronic image converters registration for OH ((9,4) and (5,1) bands - 7700 to 8100 A) and OI (6300 A) emissions were used. The zenith region was observed, and exposure time was 2 minutes. This corresponds to averaging of the emission intensities along the airplane trace over a distance of 10 km. Simultaneous measurements of atmospheric temperature variations at the flight altitude were made. R.J.F.

N85-20481*# University of Western Ontario, London. Dept. of Physics.

TWILIGHT INTENSITY VARIATION OF THE INFRARED HYDROXYL AIRGLOW c46

R. P. Lowe, K. L. Gilbert, and R. J. Niciejewski *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 176-178 (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The vibration rotation bands of the hydroxyl radical are the strongest features in the night airglow and are exceeded in intensity in the dayglow only by the infrared atmospheric bands of oxygen. The variation of intensity during evening twilight is discussed. Using a ground-based Fourier Transform Spectrometer (FTS), hydroxyl intensity measurements as early as 3 deg solar depression were made. Models of the twilight behavior show that this should be sufficient to provide measurement of the main portion of the twilight intensity change. The instrument was equipped with a liquid nitrogen-cooled germanium detector whose high sensitivity combined with the efficiency of the FTS technique permits spectra of the region 1.1 to 1.6 microns at high signal-to-noise to be obtained in two minutes. The use of a polarizer at the entrance aperture of the instrument reduces the intensity of scattered sunlight by a factor of at least ten for zenith observations. R.J.F.

N85-20482*# Hungarian Academy of Sciences, Sopron. Geodetic and Geophysical Research Inst.

INVESTIGATION OF AERONOMIC PROCESSES ON THE BASIS OF IONOSPHERIC SPORADIC E c46

P. Bencze *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 179-182 refs (For primary document see N85-20450 11-42)

Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

A method by means of which the characteristics of atmospheric turbulence can be determined is discussed. Turbulent diffusivity deduced from ionospheric sporadic E in different altitudes above the ionospheric stations at Bekescsaba and Juliusrah are given. Seasonal variations in different altitudes above Bekescsaba are shown. An attempt was made to determine the variation of the turbulent diffusivity during and after geomagnetic disturbances by computing the horizontal wind velocity from the thermal wind equation. It is argued that the change of the turbulent diffusivity below the turbopause is opposed to that above the turbopause. R.J.F.

N85-20483*# Academy of Sciences (USSR), Ashkhabad. Physico-Technical Inst.

SPACE AND TIME VARIATIONS AND TURBOPAUSE DYNAMICAL STRUCTURE c46

O. G. Ovezgeldiyev, L. P. Korsunova, and Yu. Karadzhayev *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 183-187

refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Time spectra of the critical frequency f sub o E sub s and blanketing frequency f sub b E sub s for the records of a spaced chain of ionosphere vertical sounding stations were studied by means of a maximum entropy method, while coherence spectra were analyzed with the Blackman and Tukey method. It was found out that the frequency parameters spectrum of E sub s within the range of 1-10 cycles/h are discrete with one or two maxima. The first, a low frequency maximum with T=40 min, is of larger amplitude, stable and exists permanently; the second one with T = 10 min is less stable, occurs irregularly and more often within f sub o E sub s. Further, the first maximum corresponds to a higher level of coherence which decreases as the distance to the stations increases. It is concluded that the low-frequency maximum is induced by cellular eddies, usually interpreted as wind shears with horizontal dimensions of not more than 300 km. Irregularity, small amplitude, and low coherence in the range of the second maximum are indicative of the fact that turbulence must be its only source. R.J.F.

N85-20484*# Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
THE HIGH LATITUDE D REGION DURING ELECTRON PRECIPITATION EVENTS c46
J. K. Hargreaves, P. N. Collis, and A. Korth (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 188-191 refs Submitted for publication (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The fluxes of energetic electrons entering the high-latitude atmosphere during auroral radio absorption events and their effect on the electron density in the auroral D region are discussed. An attempt was made to calculate the radio absorption during precipitation events from the fluxes of energetic electrons measured at geosynchronous orbit, and then to consider the use of absorption measurements to indicate the magnetospheric particle fluxes, the production rates, and electron densities in the D region. R.J.F.

N85-20485*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar Terrestrial Physics.
HIGH ENERGY PARTICLE EFFECTS IN THE D REGION DURING AND AFTER GEOMAGNETIC STORMS Abstract Only c46
E. A. Lauter and C.-U. Wagner *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 192 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The precipitation of energetic particles from the magnetosphere produces a remarkable modification of the mid-latitude D-region structure during daytime and at dawn and dusk conditions. Beside the heavily fluctuating precipitation during the main storm phase, there exists a more continuous input of high energy electrons into the mesosphere in the belt between phi= 50 deg and the auroral zone up to ten days after the disturbance. The excessive D-region ionization, the after-effect of geomagnetic storms, is caused at least partly by additional nitric oxide production. The winter anomaly effects are especially amplified and prolonged by this effect. The source of this mid-latitude particle precipitation is thought to be situated in magnetospheric slot region processes. R.J.F.

N85-20486*# Ceskoslovenska Akademie Ved, Prague. Geophysical Inst.
SOLAR FLARE AND IMF SECTOR STRUCTURE EFFECTS IN THE LOWER IONOSPHERE c92
J. Lastovicka *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 193-199 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

About 1% of all sudden ionospheric disturbances (SIDs) observed at the Panska Ves Observatory (Czechoslovakia), were found to be not of solar-XUV origin. Among them, the very rare SWF events (observed at L = 2.4) of corpuscular origin are the most interesting. The IMF sector structure effects in the midlatitude lower ionosphere are minor in comparison with effects of solar flares, geomagnetic storms, etc. There are two basic types of effects. The first type is a disturbance, best developed in geomagnetic activity, and observed in the night-time ionosphere. It can be interpreted as a response to sector structure related changes of geomagnetic (= magnetospheric) activity. The other type is best developed in the tropospheric vorticity area index and is also observed in the day-time ionosphere in winter. This effect is quietening in the ionosphere as well as troposphere. While the occurrence of the former type is persistent in time, the latter is severely diminished in some periods. All the stratosphere, the 10-mb level temperature and height above Berlin-Tempelhof do not display any observable IMF section structure effect. Author

N85-20487*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionosphere Research.
DEPENDENCE OF THE HIGH LATITUDE MIDDLE ATMOSPHERE IONIZATION ON STRUCTURES IN INTERPLANETARY SPACE c46
J. Bremer and E. A. Lauter *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 200-204 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

The precipitation of high energetic electrons during and after strong geomagnetic storms into heights below 100 km in middle and subauroral latitudes is markedly modulated by the structure of the interplanetary magnetic field (IMF). Under relative quiet conditions the D-region ionization caused by high energetic particle precipitation (energies greater than 20 to 50 keV) depends on changes of the interplanetary magnetic field and also on the velocity of the solar wind. To test this assumption, the influence of the IMF-sector boundary crossings on ionospheric absorption data of high and middle latitudes by the superposed-epoch method was investigated. B.G.

N85-20488*# Hungarian Academy of Sciences, Sopron. Geodetical and Geophysical Research Inst.
SOLAR TERRESTRIAL INFLUENCES ON THE D REGION AS SHOWN BY THE LEVEL OF ATMOSPHERIC RADIO NOISE c46
G. Satori and B. Schaning (Academy of Sciences, Kuhlungsborn, East Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 205-210 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Measurements of the integrated atmospheric radio noise field strength at 27 kHz, used here, were made from 1965 to 1975 at Uppsala, Kuhlungsborn, and Prague-Panska Ves. The large scale meteorological situation was considered by comparing solar disturbed and undisturbed periods under similar weather situations. In order to show the effects of the precipitating high energy particle (HEP) flux and of the Forbush decrease on the noise level between pairs of stations were computed as deviations from the monthly median. Delta E (dB), day by day for all six periods was studied. The correlation coefficients for noon as well as for night values were computed. The correlation coefficients were compared with those for solar undisturbed periods. B.G.

N85-20489*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar Terrestrial Physics.
LATITUDINAL DEPENDENCE OF THE ENERGY INPUT INTO THE MESOSPHERE BY HIGH ENERGY ELECTRONS c46
C. U. Wagner, B. Nikutowski, and H. Ranta (Geophysical Observatory, Sodankyla, Finland) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 211-212 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Night-time ionspheric absorption measurements give the possibility to study the precipitation of high energy electrons into the mesosphere during and after magnetospheric storms. The uniform Finnish riometer network was used together with measurements from Kuhlungsborn and Collm (GDR) to investigate the night-time absorption as a function of latitude (L=6.5 to 2.5) and storm-time for seven storms. The common trends visible in all these events are summarized in a schematic average picture, showing the distribution of increased ionospheric absorption as a function of latitude (L value) and storm-time. B.G.

N85-20490*# Academy of Sciences, Neustrelitz (East Germany). Inst. of Space Research.
OZONE MEASUREMENTS IN THE MESOSPHERE DURING A SOLAR PROTON EVENT c46
W. Lippert and D. Felske *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 213-215 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Charged particle precipitation in the Earth's atmosphere produces odd nitrogen and odd hydrogen. These species take part in catalytic reactions which destroy atmospheric ozone in the stratosphere and mesosphere. Modeling efforts regarding the impact of these ionization events on the neutral atmosphere describe ozone depletions in good agreement with observations in the stratosphere and mesosphere. The photochemical effects of the solar proton event (SPE) of August 1972 are discussed, and calculations for higher altitudes (70 to 90 km) are presented that indicate after a brief reduction during and immediately following intense particle precipitation, ozone will later reach higher concentrations than those present before the event. Author

N85-20491*# Academy of Sciences, Neustrelitz (East Germany). Inst. of Space Research.
GEOMAGNETIC DISTURBANCES CAUSED BY INTERNAL ATMOSPHERIC DYNAMICS c46
G. Sonneman *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 216-220 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 08G

It is commonly believed that geomagnetic disturbances are caused by external influences connected with the solar wind. The 27-day recurrence of perturbations seems to be a strong hint for this interaction. But frequently geomagnetic disturbances occur without any relation to sunspot numbers or radiowave fluxes. This was one of the reasons for introducing hypothetical M-regions on the Sun and their relation to solar wind activities. Only one half of the variance of the geomagnetic AL-index could be related to the solar wind. Therefore it is concluded that internal processes of the magnetosphere were responsible for additional geomagnetic activity. Arguments, which might lead to the suggestion of geomagnetic disturbances as being caused by internal atmospheric dynamics are discussed and a rather preliminary scenario of those processes is proposed. Author

N85-20492*# International Council of Scientific Unions, Urbana, Ill.
MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP. VOLUME 12: COORDINATED STUDY OF THE BEHAVIOR OF THE MIDDLE ATMOSPHERE IN WINTER (PMP-1) WORKSHOPS
C. D. Rodgers, ed. (Oxford Univ.) Jul. 1984 159 p refs Workshops held in Boulder, Colo., 11-14 May 1982, in Oxford, 12-15 Apr. 1983, and in Hamburg, 17 Aug. 1983
(Contract NASw-3805)
(NASA-CR-175475; NAS 1.26:175475; MAP-HANDBOOK-12)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

Intercomparison of middle atmosphere meteorological data from a variety of sources is discussed. The primary aim was to intercompare data on stratospheric and mesospheric temperatures from a variety of sounding systems in order to characterize the differences, to understand the reasons for them, and to help users of the data to understand how these differences will affect derived quantities such as heat and momentum fluxes which are significant in studies of stratospheric dynamics. R.J.F.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-20493 Bayerische Akademie der Wissenschaften, Munich (West Germany). Deutsche Geodaetische Kommission.
A THREE-DIMENSIONAL GEOMETRIC-PHYSICAL MODEL FOR CONVENTIONAL GEODETIC OBSERVATIONS-OBSERVABLES, PARAMETER ESTIMATION, AND DEFORMATION ANALYSIS Ph.D. Thesis - Stuttgart Univ. [EIN DREIDIMENSIONALES GEOMETRISCH-PHYSIKALISCHES MODELL FUER KONVENTIONELLE GEODAETISCHE BEOBACHTUNGEN - BEOBACHTUNGSFUNKTIONALE, PARAMETERSCHAETZUNG UND DEFORMATIONSANALYSE]
Jochen Zaiser 1984 108 p refs In GERMAN
(Ser-C-298; ISBN-3-7696-9348-5; ISSN-0065-5325) Copyright. Avail: Issuing Activity

Conventional geodetic observations are analytically presented in a space-time-like, holonomic, geometric-physical model, for operational geodesy. The approximation coordinates are calculated using a cartesian representation of the normal gravity field via the isoparametric telluroid representation. Geodetically relevant aspects of geodynamics are discussed and crustal deformations are classified. The three-dimensional analysis of crustal deformations uses the displacement field theory. The three-dimensional point determination and deformation analysis theory is experimentally investigated. Date fixing; effect of the vertical direction observation on the network configuration; and invariance of the observables of the displacement field and their prediction force are discussed. Author (ESA)

N85-20494 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE 1980 DIAGNOSTIC ADJUSTMENT OF THE GERMAN MAIN TRIANGULATION NETWORK. 4: NETWORK ADJUSTMENT (PART 3) [DIE DIAGNOSEAUSGLEITCHUNG 1980 DES DEUTSCHEN HAUPTDREIECKSNETZES. IV: NETZAUSGLEICHUNG (TEIL 3)]
Dieter Ehlert 1984 111 p In GERMAN Original contains color illustrations
(Ser-B-267-Pt-3-Mitt-168; ISSN-0071-9196) Avail: NTIS HC A06

Details of the diagnostic adjustment of the German main triangulation network are presented. Improvements in the combined, direction and distance networks; error ellipses of the combined, direction and distance networks; gaps in the direction

and distance networks in comparison with the combined network; gaps in the distance network in comparison with the direction network; and gaps in the direction distance and combined networks in comparison with the German main triangulation network are covered. Author (ESA)

N85-20495 Bayerische Akademie der Wissenschaften, Munich (West Germany). Deutsche Geodaetische Kommission.
THE GAUSS-KRUEGER PROJECTION OF THE EARTH ELLIPSOID WITH DIRECT CALCULATION OF ELLIPTIC INTEGRALS THROUGH LANDEN TRANSFORMATIONS Ph.D. Thesis - Technische Universitaet, Munich [DIE GAUSS-KRUEGERSCHE ABBILDUNG DES ERDELLIPSOIDES MIT DIREKTER BERECHNUNG DER ELLIPTISCHEN INTEGRALE DURCH LANDENTRANSFORMATION]
Michael Gerstl 1984 57 p refs In GERMAN
(Ser-C-296; ISBN-3-7696-9346-9; ISSN-0065-5325) Copyright. Avail: Issuing Activity

The arc length of the meridian as a function of the geographic latitude is given by a second order elliptic integral. The Gauss-Kruger transformation is given by the complex analytic form of this integral. The numerical expression is possible through a series of Landen transformations. The Gauss-Kruger projection enables a numerical calculation of the entire severed spheroid. The complex sterographic variables are derived from the geographic coordinates, then with a Newton iteration the exporential function of the complex latitude, which is an argument of the elliptic integral. In geodesic applications a 3 deg band each side of the meridian is enough, and an error estimation shows that 2 instead of the normal 3 Landen transformation provide accurate results. Author (ESA)

N85-20496*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-4 SCIENCE CHARACTERIZATION EARLY RESULTS. VOLUME 1: MULTISPECTRAL SCANNER (MSS)
John L. Barker, ed. Washington Jan. 1985 206 p refs Symp. held in Greenbelt, Md., 22-24 Feb. 1983 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS 4 Vol.
(E85-10067; NASA-CP-2355-Vol-1; Rept-85B0115-Vol-1; NAS 1.55:2355-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 05B

LANDSAT 4 MSS data was characterized from a geometric, radiometric, geodetic, temporal, and spatial standpoint. Comparisons were made between LANDSAT 4 MSS data and similar data generated by earlier LANDSAT satellites. Error analyses were conducted on MSS data sets and band-to-band registration accuracy was evaluated. For individual titles, see N85-20497 through N85-20507.

N85-20497*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUMMARY OF MSS CHARACTERIZATION INVESTIGATIONS
William L. Alford and Marc L. Imhoff *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 1-8 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 14B

The geometric quality of LANDSAT MSS data processed by the MSS image processing system (MIPS) is discussed. The accuracy of systematic and geodetic corrections done to MSS scenes is considered along with temporal and band to band registration accuracy. A comparison of scene to scene registration accuracies achievable within the LANDSAT 2/3 series with those between LANDSAT 4 and the LANDSAT 2/3 series is mentioned. Radiometric characterization of MSS data is also addressed. Spectral characteristics, banding characteristics, and woodgrain noise pattern are discussed. R.S.F.

N85-20498*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIOMETRIC ACCURACY ASSESSMENT OF LANDSAT 4 MULTISPECTRAL SCANNER DATA
William L. Alford and Marc L. Imhoff *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 9-22 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 05B

The LANDSAT 4 mission has unique characteristics relative to previous LANDSAT missions. The effects of these changes on the character of MSS radiometric data were explored. The histogram calibration process made a significant reduction of the channel differences within a band. If this improvement proves consistent over a wide radiometric range and persists over time, LANDSAT 4 MSS may not have the banding problems that plagued previous MSS instruments. For a simultaneous overpass of LANDSAT 3 and 4, uniform test areas were selected that were common in both data sets. Significant differences in radiance values between the two satellites were observed when R sub max and R sub min were used to compute obsolute radiance values. Ground truth should be used to determine new values. A woodgrain appearing pattern is apparent in the MSS images that were not apparent in previous MSS's. It is believed to be caused by many different frequency components, most of which originate from a common source. R.S.F.

N85-20499*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL CHARACTERIZATION OF THE LANDAT-4 MSS SENSORS
Brian L. Markham and John L. Barker *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 23-56 refs Previously announced in IAA as A83-36575 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 14B

Two multispectral scanner subsystems (MSS) have been fabricated and tested by an American aerospace company for the NASA LANDSAT program. One MSS, designated the protoflight (PF) model, was integrated into the LANDSAT-4 spacecraft, which was launched on July 16, 1982. The second, designated the flight (F) model, has been integrated into the LANDSAT-4 backup satellite, which is scheduled for possible launch in 1985. Each MSS has four bands in the reflective portion of the electromagnetic spectrum. The engineering test deta which were collected included channel-by-channel spectral response curves. A description of the test procedure is included in Appendix A. This document is to make available to the LANDSAT user community data on the spectral characteristics of the two sensors. The LANDSAT-4 PF and F scanners were found to be essentially identical in mean spectral response. G.R. (IAA)

N85-20500*# Environmental Research Inst. of Michigan, Ann Arbor.
INVESTIGATION OF RADIOMETRIC PROPERTIES OF LANDSAT-4 MSS
Daniel P. Rice and William A. Malila *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 57-76 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 05B

Detector calibration and satellite-to-satellite calibration are discussed with respect to the characterization of LANDSAT 4 image data quality. LANDSAT data for California, North Carolina, South Carolina, and New England were utilized. Banding, quantization effects, coherent noise, relative calibration between LANDSAT 3 and 4, and geometric considerations are addressed. Evidence strongly suggests that LANDSAT 4 data are of the same high quality as previous LANDSATS, with a comparable dynamic range and target response, a good detector equalization procedure, and and accurate linear response to received radiance. A linear relationship between LANDSAT 3 and 4 was determined that renders LANDSAT 4 signals to have the same radiance response as LANDSAT 3 signals. Two artifacts, not noted in previous LANDSATS, were found and quantified. One is a geometric scan line length variation in LANDSAT A tapes, and was shown to be

fairly well correctable. The other artifact is a coherent noise effect in all bands, having an amplitude of less than one count. R.S.F.

N85-20501*# Canada Centre for Remote Sensing, Ottawa (Ontario).
RADIOMETRIC CALIBRATION AND GEOCODED PRECISION PROCESSING OF LANDSAT-4 MULTISPECTRAL SCANNER PRODUCTS BY THE CANADA CENTRE FOR REMOTE SENSING
J. Murphy, D. Bennett, and F. E. Guertin *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 77-118 refs ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 05B

The methodology used to perform radiometric calibration and precision geometric correction of standard LANDSAT 4 MSS products is described. It is shown how the same algorithms are used to radiometrically correct and to place on a calibrated radiance scale the data from all four LANDSAT satellites. To assess the reliability of absolute calibration, the minor variations observed in the LANDSAT 4 calibration data are discussed. Comparison of overlapping LANDSAT 3 and LANDSAT 4 scenes acquired at the same time is proposed. The concept of geocoded products is reviewed. It is shown that the geometric correction model developed to precision-process the MSS data from the earlier LANDSAT satellites can generate LANDSAT 4 MSS geocoded products with comparable geodetic accuracy. The results are seen as preliminary and are expected to be refined and augmented as more LANDSAT 4 data are acquired and processed. R.S.F.

N85-20502*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.
LANDSAT SCENE-TO-SCENE REGISTRATION ACCURACY ASSESSMENT
James E. Anderson *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 119-122 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 05B

The scene-to-scene registration performance of the MSS on LANDSAT-4 relative to LANDSAT 1 through 3 MSS systems was evaluated. The temporal registration performance of LANDSAT 4 TM data sets was determined. A tabular comparison is presented of LANDSAT 2 and 4 element error, scan line error, registration RMS error, and indicated RMS error at the time of mapping equation development. The 1980/1982 registration resulted in an element error which was nearly twice as large as that obtained in the 1980/1981 registration (40.320 vs. 20.416 meters). This occurred even though the scan line errors were nearly identical (26.951 vs. 26.701 meters). Subsequent analysis indicated that the large element error encountered in the 1980/1982 temporal registration may be the result of less than adequate modeling of the LANDSAT 4 MSS scan mirror profile. R.S.F.

N85-20503*# Georgia Univ., Athens. Dept. of Geography.
GEOMETRIC ACCURACY OF LANDSAT-4 MSS IMAGE DATA
R. Welch and E. Lynn Usery *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 123-132 refs Previously announced as N83-27322 ERTS (For primary document see N85-20496 11-43)
(Contract NAS5-27383)
Avail: NTIS HC A10/MF A01 CSCL 08B

Analyses of the LANDSAT-4 MSS image data of North Georgia provided by the EDC in CCT-p formats reveal that errors of approximately + or - 30 m in the raw data can be reduced to about + or - 55 m based on rectification procedures involving the use of 20 to 30 well-distributed GCPs and 2nd or 3rd degree polynomial equations. Higher order polynomials do not appear to improve the rectification accuracy. A subscene area of 256 x 256 pixels was rectified with a 1st degree polynomial to yield an RMSE sub xy value of + or - 40 m, indicating that USGS 1:24,000 scale quadrangle-sized areas of LANDSAT-4 data can be fitted to a map base with relatively few control points and simple equations. The errors in the rectification process are caused by the spatial resolution of the MSS data, by errors in the maps and GCP digitizing process, and by displacements caused by terrain relief. Overall, due to the improved pointing and attitude control of the spacecraft, the geometric quality of the LANDSAT-4 MSS data appears much improved over that of LANDSATS -1, -2 AND -3. M.G.

N85-20504*# EROS Data Center, Sioux Falls, S. Dak.
GEODETIC ACCURACY OF LANDSAT 4 MULTISPECTRAL SCANNER AND THEMATIC MAPPER DATA
J. M. Thormodsgard and D. J. DeVries *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 133-142 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 08E

The geodetic accuracy of LANDSAT 4 data from both the MSS and TM processing systems was evaluated. The procedure was based on comparing the calculated image location, computed with the geodetic referencing algorithms, with the true image location visually located on a display device. Results of the testing of geodetic accuracy of three MSS scenes (Washington, DC, central Alabama, and Los Angeles, CA) and two TM scenes (Aberdeen, SD and Galesburg, IL) are presented. The calculated and actual image locations of the ground control points are shown. The offset between the calculated and actual image location, as well as the offset vector magnitude or pixel error, are given. R.S.F.

N85-20505*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOMETRIC ACCUARCY ASSESSMENT OF LANDSAT-4 MULTISPECTRAL SCANNER (MSS) DATA
Marc L. Imhoff and William L. Alford *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 143-158 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 08E

Standard LANDSAT 4 MSS data for Washington, DC was analyzed to characterize the geodetic, temporal registration, and band-to-band registration accuracy of standard P-format MSS image data. Geodetic accuracy was assessed by comparing geodetic verification points selected from U.S. Geological Survey (USGS) topographic triangles against the corresponding LANDSAT 4 image feature locations. Cross-correlation was used to evaluate band-to-band and temporal registration accuracy. The geometric accuracies of LANDSAT 4 MSS data are excellent. The geodetic registration accuracy appears very good. The LANDSAT data closely match the USGS map products with image-to-map offset errors of < 5 (57 x 57 m) pixels. Temporal registration accuracy is also quite good although results from this analysis do not meet specifications. The specifications for temporal registration are 0.3 sensor (82 x 82 m) pixel or 24.6 m 90 percent of the time. The results show that the 90 percent error figure for temporal registration is 0.68 (57 x 57 m) pixel or 38.8 meters. Band-to-band registration could be considered to meet specifications. The registration error between the bands having naturally higher correlations between information content (bands 1 and 2 and bands 3 and 4) proved to meet specifications 14.2m and 13.7m, respectively. R.S.F.

N85-20506*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPACT OF LANDSAT MSS SENSOR DIFFERENCES ON CHANGE DETECTION ANALYSIS
William C. Likens and Robert C. Wrigley *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 159-176 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 02F

Change detection techniques were used to pinpoint differences between LANDSAT 4 and earlier LANDSAT MSS sensors. Scattergrams between co-registered scenes were utilized to radiometrically compare data from the various MSS sensors. MSS data for San Francisco, CA; southeast New Mexico; Connecticut; and New

Hampshire were compared. There appear to be no major problems preventing use of LANDSAT 4 MSS with previous MSS sensors for change detection, provided the interference noise can be removed or minimized. This noise may result in detection of spurious changes, as well as affect other uses of the data, including image classification. Analysis of dark (water and forests), rather than light, features is most impacted because the noise will form a higher percentage of the total response at low DN values. The patterns are sweep dependent, and within a sweep it it not clear that they are completely systematic. R.S.F.

N85-20507*# General Electric Co., Lanham, Md. Space Div.
LS-4 MSS GEOMETRIC CORRECTION: METHODS AND RESULTS
J. Brooks, E. Kimmer, and J. Su *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 1 Jan. 1985 p 177-200 ERTS (For primary document see N85-20496 11-43)
Avail: NTIS HC A10/MF A01 CSCL 12A

Methods and results of the effort that fine-tuned both the software and data base and assessed the geometric performance of the calibrated LANDSAT 4 system are described. The systematic correction data surface, the geodetic correction data surface, and the MSS filter that links them are discussed. R.S.F.

N85-20508*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-4 SCIENCE CHARACTERIZATION EARLY RESULTS. VOLUME 2, PART 1: THEMATIC MAPPER (TM)
John L. Barker, ed. Washington Jan. 1985 482 p refs Symp. held in Greenbelt, Md., 22-24 Feb. 1983 Original contains imagery. Original photography may be purchased at the EROS Data Center, Sioux Falls, S.D. 57198 ERTS 4 Vol.
(E85-10068; NASA-CP-2355-Vol-2-Pt-1; Rept-85B0115-Vol-2-Pt-1; NAS 1.55:2355-Vol-2-Pt-1) Avail: NTIS HC A21/MF A01 CSCL 08B

An overview of the LANDSAT 4 satellite is given. Spectral, radiometric, and geometric characteristics of the thematic mapper are discussed as well as methods for instrument calibration and data rectification. For individual titles, see N85-20509 through N85-20516.

N85-20509*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN OVERVIEW OF LANDSAT-4 AND THE THEMATIC MAPPER
James R. Irons *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 15-46 refs ERTS (For primary document see N85-20508 11-43)
Avail: NTIS HC A21/MF A01 CSCL 08B

The LANDSAT-4 satellite, its sensor payload, its orbit, and the acquisition and processing of thematic mapper (TM) data are described. The satellite is designed to use the tracking and data relay satellite (TDRS) system to transmit both MSS and TM data to a ground station. The capability to transmit the data directly to ground stations is provided for the interim between the launch of LANDSAT-4 and the initiation TDRS operations. Unfortunately, after transmitting approximately 6000 TM scenes, the transmitter for TM data failed and additional TM data cannot often be received until routine TDRS operations begin. The available TM data are undergoing radiometric and geometric corrections to provide TM investigators with pictorial and digital image data. Early analyses of TM data indicate that the geometric and radiometric characteristics of the data exceed or are comparable to prelaunch specifications. A.R.H.

N85-20510*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIOMETRIC CALIBRATION AND PROCESSING PROCEDURE FOR REFLECTIVE BANDS ON LANDSAT-4 PROTOFLIGHT THEMATIC MAPPER
J. L. Barker, R. B. Abrams (Computer Sciences Corp., Silver Spring, Md.), D. L. Ball (Computer Sciences Corp., Silver Spring, Md.), and K. C. Leung (Computer Sciences Corp., Silver Spring, Md.) *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 47-86 refs Previously announced as N84-31731 ERTS (For primary document see N85-20508 11-43)
Avail: NTIS HC A21/MF A01 CSCL 08B

The radiometric subsystem of NASA's LANDSAT-4 Thematic Mapper (TM) sensor is described. Special emphasis is placed on the internal calibrator (IC) pulse shapes and timing cycle. The procedures for the absolute radiometric calibration of the TM channels with a 122-centimeter integrating sphere and the transfer of radiometric calibration from the channels to the IC are reviewed. The use of the IC to calibrate TM data in the ground processing system consists of pulse integration, pulse averaging, IC state identification, linear regression analysis, and histogram equalization. An overview of the SCROUNGE-era (before August 1983) method is presented. Procedural differences between SCOUNGE and the TIPS-era (after July 1983) and the implications of these difference are discussed. Author

N85-20511*# General Electric Co., Philadelphia, Pa.
AN OVERVIEW OF THE THEMATIC MAPPER GEOMETRIC CORRECTION SYSTEM
Eric P. Beyer *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 87-146 refs ERTS (For primary document see N85-20508 11-43)
(Contract NAS5-25300)
Avail: NTIS HC A21/MF A01 CSCL 08B

The processing concepts which form the basis of the NASA TM geometric correction system are summarized. This system serves to place TM image samples onto an output coordinate system which is related to a map projection. The flight segment includes the TM instrument, attitude measurement devices, attitude control, and ephemeris processing. A spacecraft formatter combines the necessary on-board computer information and angular displacement sensor samples into a 32-kilobit per second telemetry stream called payload correction data. These data are downlinked on a telemetry channel and included with TM wideband data. Ground segment processes performed include: payload correction, control point processing, and geometric correction (resampling). A.R.H.

N85-20512*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TM DIGITAL IMAGE PRODUCTS FOR APPLICATIONS
John L. Barker, Fred J. Gunther (Computer Sciences Corp., Silver Spring, Md.), Rochelle B. Abrams (Computer Sciences Corp., Silver Spring, Md.), and Dave L. Ball (Computer Sciences Corp., Silver Spring, Md.) *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 147-220 refs Original contains imagery. Original photography may be purchased at the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N85-20508 11-43)
Avail: NTIS HC A21/MF A01 CSCL 08B

LANDSAT-4 TM images recorded on computer compatible tapes (CCTs) are currently available in the following tape formats: (1) raw rectified data (CCT-BT); (2) calibrated data (CCT-AT); and (3) geometrically corrected data (CCT-PT). These formats represent different steps in the process of producing fully-corrected TM data. The CCT-BT images are rectified from telemetry format to image format, but are uncorrected radiometrically and geometrically; they are generally used for internal transportation of data from one ground processing system to another. The CCT-AT images have had data from faulty channels replaced and all data radiometrically calibrated to produce an archive image; they are available to researches for radiometric characterization. The final products, the CCT-PT images, have been resampled by cubic convolution procedures to provide a geometrically corrected image using satellite ephemeris data. The CCT-PT image is the one to which all of the various radiometric and geometric corrections have been applied; this is the product that is the product that is available to all users. A.R.H.

N85-20513*# Canada Centre for Remote Sensing, Ottawa (Ontario).
CANADIAN PLANS FOR THEMATIC MAPPER DATA
W. M. Strome, F. E. Guertin, A. B. Collins, and D. G. Goodenough *In* NASA. Goddard Space Flight Center LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 221-234 refs ERTS (For primary document see N85-20508 11-43)
Avail: NTIS HC A21/MF A01 CSCL 08B

To improve the quality of data obtained from remote sensing satellites, and thereby improve Canada's resource management capability, facilities were to enable them to receive, record, process, distribute and analyze TM and MSS data from LANDSAT-4. The CCT format used was changed to the standard format family to make it compatible with other ground stations. All MSS data are now in that format. The antenna, at Prince Albert were modified to receive TM X-band data and a transcription system was added to convert high density digital tape to CCT format. A bulk processing system is being developed to provide geometrically corrected MSS, TM, and SPOT products. Methods are being investigated for integrating multiple pixel data from different satellites and other sources using a digital image analysis system that is being established. A cost benefits study is also underway. A.R.H.

N85-20514*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL CHARACTERIZATION OF THE LANDSAT THEMATIC MAPPER SENSORS
Brian L. Markham and John L. Barker *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 235-276 refs Previously announced as N84-30402 ERTS (For primary document see N85-20508 11-43)
Avail: NTIS HC A21/MF A01 CSCL 08B

Relative spectral response data for the LANDSAT-4 and LANDSAT-4 backup multispectral scanner subsystems (MSS), the protoflight and flight models, are presented and compared to similar data for the LANDSAT 1, 2 and 3 scanners. Channel (six channels per band) outputs for soil and soybean targets were simulated and compared within each band and between scanners. Channel (six channels per band) outputs for soil and soybean targets were simulated and compared within each band and between scanners. The principal differences between the spectral responses of the LANDSAT-4 scanners and previous scanners are discussed. The simulated LANDSAT-4 scanner outputs were 3 to 10 percent lower in the red band and 3 to 11 percent higher in the first near-IR band than previous scanners for the soybeans targets. The LANDSAT-4 scanners were generally more uniform from channel to channel within bands than previous scanners. In the upper-band edge of the red band of the protoflight scanner, one channel was markedly different (12 nm) from the rest. For a soybeans target, this nonuniformity resulted in a within-band difference of 6.2 percent in simulated outputs between channels. A.R.H.

N85-20515*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELAUNCH ABSOLUTE RADIOMETRIC CALIBRATION OF THE REFLECTIVE BANDS ON THE LANDSAT-4 PROTOFLIGHT THEMATIC MAPPER
John L. Barker, D. L. Ball (Computer Sciences Corp., Silver Spring, Md.), K. C. Leung (Computer Sciences Corp., Silver Spring, Md.), and J. A. Walker (Santa Barbara Research Center, Goleta, Calif.) *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 277-372 refs Previously announced as N84-31751 ERTS (For primary document see N85-20508 11-43)
Avail: NTIS HC A21/MF A01 CSCL 08B

The results of the absolute radiometric calibration of the LANDSAT 4 thematic mapper, as determined during pre-launch tests with a 122 cm integrating sphere, are presented. Results for the best calibration of the protoflight TM are given, as well as summaries of other tests performed on the sensor. The dynamic range of the TM is within a few percent of that required in all bands, except bands 1 and 3. Three detectors failed to pass the minimum SNR specified for their respective bands: band 5, channel 3 (dead), and band 2, channels 2 and 4 (noisy or slow response). Estimates of the absolute calibration accuracy for the TM show that the detectors are typically calibrated to 5% absolute error for the reflective bands: 10% full-scale accuracy was specified. Ten tests performed to transfer the detector absolute calibration to the internal calibrator show a 5% range at full scale in the transfer calibration; however, in two cases band 5 showed a 10% and a 7% difference. Author

N85-20516*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARACTERIZATION OF RADIOMETRIC CALIBRATION OF LANDSAT-4 REFLECTIVE BANDS
John L. Barker, R. B. Abrams (Computer Sciences Corp., Silver Spring, Md.), D. L. Ball, and K. C. Leung (Computer Sciences Corp., Silver Spring, Md.) *In its* LANDSAT-4 Sci. Characterization Early Results, Vol. 2, Pt. 1 Jan. 1985 p 373-474 refs Previously announced as N84-31753 ERTS (For primary document see N85-20508 11-43)
Avail: NTIS HC A21/MF A01 CSCL 08B

Prelaunch and postlaunch internal calibrator, image, and background data is to characterize the radiometric performance of the LANDSAT-4 TM and to recommend improved procedures for radiometric calibration. All but two channels (band 2, channel 4: band 5, channel 3) behave normally. Gain changes relative to a postlaunch reference for channels within a band vary within 0.5 percent as a group. Instrument gain for channels in the cold focal plane oscillates. Noise in background and image data ranges from 0.5 to 1.7 counts. Average differences in forward and reverse image data indicate a need for separate calibration processing of forward and reverse scans. Precision is improved by increasing the pulse integration width from 31 to 41 minor frames, depending on the band. M.A.C.

N85-20517# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data and Information Service.
EARTH OBSERVATIONS AND THE POLAR PLATFORM
John H. McElroy and Stanley R. Schneider Jan. 1985 21 p refs
(NOAA-TR-NESDIS-18) Avail: NTIS HC A02/MF A01

The Polar Platform component of NASA's Space Station Project may be used for operational monitoring of the oceans, land surfaces, atmosphere and space environment. Issues addressed include data and sensor requirements, platform configuration, platform servicing, international participation, communications and research support. Author

N85-20518# Geological Survey, Menlo Park, Calif.
INDEX TO PUBLISHED GEOLOGIC MAPS IN THE REGION AROUND THE POTENTIAL YUCCA MOUNTAIN NUCLEAR WASTE REPOSITORY SITE, SOUTHERN NYE COUNTY, NEVADA
Suzanne C. Fouty, comp. 1984 34 p refs
(Contract DE-AI08-78ET-44802)
(DE85-000260; USGS-OFR-84-524) Avail: NTIS HC A03/MF A01

Yucca Mountain, located in southern Nye County, Nevada is currently being investigated as a potential site for an underground high-level radioactive waste repository. The series of index maps presented in this report provide an up-to-date reference of published geologic maps covering the Candidate Area. The published maps range in scale from 1:1200 through 1:700,000 and includes maps published by the USGS, state and commercial organizations, universities, and professional societies. USGS open-file maps also are shown, but no attempt is made to include open-file material of other organizations. DOE

N85-20519# Geological Survey, Augusta, Maine.
PEAT RESOURCES OF MAINE. VOLUME 1: AROOSTOOK COUNTY
Cornelia C. Cameron, Michael K. Mullen, Carolyn A. Lepage, and Walter A. Anderson 1984 112 p refs

(Contract DE-FG18-79ET-14690)
(DE85-004196; DOE/ET-14690/T2-Vol-1) Avail: NTIS HC A06/MF A01

In July 1979, the Maine Office of Energy Resources, in conjunction with the Maine Geological Survey, began the Maine Peat Resource Evaluation Program. The Program, which was funded by the US Department of Energy (DOE), was undertaken to determine the amount and location of fuel-grade peat on Maine. Two hundred thirty three areas containing peat deposits were evaluated under the Program. A total of 42 deposits covering 11,498 acres and containing 18,851,400 short tons (dry weight) of peat in Aroostook County were evaluated under the Maine Peat Resource Evaluation Program. These deposits range in size from 30 to 1936 acres and in estimated resources from 48,000 to 3,872,000 short tons. Maps of individual deposits showing the distribution and depth of peat, core sites, and the surficial geology of the area adjacent to the deposits are shown. Cores showing the vertical distribution of peat and sediments as well as sample locations, and results of laboratory analyses are also included. DOE

N85-20520# Geological Survey, Washington, D.C.
PEAT RESOURCES OF MAINE. VOLUME 4: SOUTHERN AND WESTERN MAINE
C. C. Cameron, M. K. Mullen, C. A. Lepage, and W. A. Anderson 1984 131 p refs
(Contract DE-FG18-79ET-14690)
(DE85-004198; DOE/ET-14690/T2-Vol-4) Avail: NTIS HC A07/MF A01

In July 1979, the Maine Office of Entry Resources, in conjunction with the Maine Geological Survey, began the Maine peat resource evaluation program. The program, which was funded by the US Department of Energy (DOE), was undertaken to determine the amount and location of fuel-grade peat in Maine. Two hundred thirty-three areas containing peat deposits were evaluated under the program. A total of 46 deposits covering 11,853 acres and containing 21,930,200 short tons (dry weight) of peat in southern and western Maine have been evaluated under the program. These deposits range in size from 55 to 732 acreas and in estimated resources from 55,000 to 1,864,000 short tons. Maps of individual deposits showing the distribution and depth of peat, core sites, and the surficial geology of the area adjacent to the deposits are shown. Cores showing the vertical distribution of peat and sediment as well as sample locations, and the results of laboratory analyses are also included. DOE

N85-20521# Los Alamos Scientific Lab., N. Mex.
INFLUENCE OF THE ATMOSPHERE ON REMOTELY SENSED REFLECTION FROM VEGETATION SURFACES
C. Simmer and S. A. W. Gerstl 1985 6 p refs Optical Society of America Topical Meeting on Optical Remote Sensing of the Atmosphere, Lake Tahoe, Nev., 15 Jan. 1985
(Contract W-7405-eng-36)
(DE85-000658; LA-UR-84-3068; CONF-850133-1) Avail: NTIS HC A02/MF A01

Multiple scattering of solar radiation in a vegetation canopy is modelled equivalent to absorbing and scattering in a turbid medium with direction-dependent cross sections. Perturbations of plant reflection patterns due to atmospheric effects are computed at different altitudes and compared to the angular reflection characteristics caused by Lambertian surfaces of varying albedoes. DOE

N85-20522# Geological Survey, Augusta, Maine. Dept. of Conservation.
PEAT RESOURCES OF MAINE. VOLUME 2: PENOBSCOT COUNTY
C. C. Cameron, M. K. Mullen, C. A. Lepage, and W. A. Anderson 1984 128 p refs
(Contract DE-FG18-79ET-14690)
(DE85-004195; DOE/ET-14690/T2-Vol-2) Avail: NTIS HC A07/MF A01

A total of 47 deposits covering 21,666 acres and containing 40,923,000 short tons (dry weight) of peat in Penobscot County were evaluated under the Maine Peat Resource Evaluation Program. These deposits range in size from 35 to 3301 acres and in estimated resources from 45,000 to 6,994,000 short tons. Maps of individual deposits showing the distribution and depth of peat, core sites, and the surficial geology of the area adjacent to the deposits are presented. Cores showing the vertical distribution of peat and sediment as well as sample locations, and the results of laboratory analyses are also included. DOE

N85-20523# Geological Survey, Augusta, Maine. Dept. of Conservation.
PEAT RESOURCES OF MAINE. VOLUME 5: WASHINGTON COUNTY
C. C. Cameron, M. K. Mullen, C. A. Lepage, and W. A. Anderson 1984 146 p refs
(Contract DE-FG18-79ET-14690)
(DE85-004197; DOE/ET-14690/T2-Vol-5) Avail: NTIS HC A07/MF A01

A total of 48 deposits covering 14,988 acres and containing 32,114,800 short tons (dry weight) of peat in Washington County were evaluated under the Maine Peat Resource Evaluation Program. These deposits range in size from 40 to 2645 acres and in estimated resources from 40,000 to 6,953,000 short tons. Maps of individual deposits showing the distribution and depth of peat, core sites, and the surficial geology of the area adjacent to the deposits are given. Cores showing the vertical distribution of peat and sediment as well as sample locations, and the results of laboratory analyses are also included. DOE

N85-20524# Geological Survey, Salt Lake City, Utah.
LOW-TEMPERATURE GEOTHERMAL ASSESSMENT OF THE JORDAN VALLEY SALT LAKE COUNTY, UTAH
Robert H. Klauk and Riki Darling Jul. 1984 211 p refs
(Contract DE-AS07-77ET-28393)
(DE85-000616; DOE/ET-28393/T6) Avail: NTIS HC A10/MF A01

Two known low-temperature areas (Warm Springs fault and Crystal Hot Springs) are located in the Jordan Valley, but the primary purpose of this report is to locate other low-temperature resources not previously identified. Geothermal reconnaissance techniques utilized in this study include a temperature survey and chemical analysis of wells and springs, and temperature-depth measurements in holes of opportunity. Also, further site specific gravity modelling for the Warm Springs fault geothermal area and initial modelling for the entire valley were also conducted. Areas identified as having potential low-temperature geothermal resources at depth are: (1) the north-central valley area; (2) an east-west portion of the central valley; and (3) a north-south oriented area extending from Draper to Midvale. Each of these areas exhibits ground-water temperatures 20 C or greater. DOE

N85-20525# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE 1980 DIAGNOSTIC ADJUSTMENT OF THE GERMAN MAIN TRIANGULATION NETWORK. 4: NETWORK ADJUSTMENT (PART 1) [DIE DIAGNOSEAUSGLEICHUNG 1980 DES DEUTSCHEN HAUPTDREIECKSNETZES. 4: NETZAUSGLEICHUNG (TEIL 1)]
Dieter Ehlert 1984 360 p refs In GERMAN
(Ser-B-267-Pt-1-Mitt-168; ISSN-0071-9196) Avail: NTIS HC A16/MF A01

Network adjustments for the diagnosis of the German main triangulation network were studied. Older global network adjustments, a functional model for diagnostic adjustment, and a stochastic model for network adjustments are presented. The choice of adjustment method, adjustment algorithm and adjustment approach is discussed. Stability of calculation and calculation samples, accuracy of the observations, adjusted coordinates, and scale unknowns and network scales are discussed. The adjustment results are compared with the German main triangulation network. The results for the combined direction and distance network are tabulated. Author (ESA)

N85-20526# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE 1980 DIAGNOSTIC ADJUSTMENT OF THE GERMAN MAIN TRIANGULATION NETWORK. 4: NETWORK ADJUSTMENT (PART 2) [DIE DIAGNOSEAUSGLEICHUNG 1980 DES DEUTSCHEN HAUPTDREIECKSNETZES. 4: NETZAUSGLEICHUNG (TEIL 2)]
Dieter Ehlert 1984 327 p refs In GERMAN
(Ser-B-267-Pt-2-Mitt-168; ISSN-0071-9196) Avail: NTIS HC A15/MF A01

The results of the diagnostic adjustment of the German main triangulation network are tabulated. Adjustment results, adjusted coordinates, and summary of the direction and distance networks are given. Comparisons of the results of the adjustment of the different networks are listed. Author (ESA)

N85-20527# National Academy of Sciences - National Research Council, Washington, D. C.
PROCEEDINGS OF A WORKSHOP ON ENVIRONMENT OF WEST ANTARCTICA: POTENTIAL CO2-INDUCED CHANGES
1984 252 p refs Proc. held in Madison, Wisc., 5-7 Jul. 1983
(Grant DE-FG01-ER-G0013)
(PB85-110757) Avail: NTIS HC A12/MF A01 CSCL 08L

A rapid reduction of the ice mass of West Antarctica leading to a drastic rise in sea level might occur as a consequence of CO2 induced warming. The climatic factors that provide the principal external forcing for the glacial ice of West Antarctica are examined. Topics discussed included historical changes of atmospheric carbon dioxide and other environmental variables; changes of the polar ice sheets; knowledge of the present environment of West Antarctica; model simulations of the present environment; and model predictions of potential CO2 induced changes. GRA

N85-20528# Geological Survey, Lakewood, Colo. Water Resources Div.
WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1983. VOLUME 1: MISSSOURI RIVER BASIN, ARKANSAS RIVER BASIN AND RIO GRANDE BASIN Annual Water-Data Report, 1 Oct. 1982 - 30 Sep. 1983
R. C. Ugland, J. T. Steinheimer, J. L. Blattner, and R. D. Steger Jul. 1984 395 p refs Sponsored in part by state of Colorado (PB85-123859; USGS/WRD/HD-84/035; USGS/WDR/CO-83/1) Avail: NTIS HC A17/MF A01 CSCL 08H

Water-resources data for Colorado for the 1983 water year consist of records of stage, discharge, and water quality of streams; stage, contents and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. Discharge records for 400 gaging stations, stage and contents of 23 lakes and reservoirs, 6 partial-record low-flow stations, peak flow information for 19 crest-stage partial record stations, and 20 miscellaneous sites; water quality for 132 gaging stations and 291 miscellaneous sites; water levels for 55 observation wells, and six pertinent stations in bordering States are included. GRA

N85-20529# Geological Survey, Lakewood, Colo. Water Resources Div.
WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1983. VOLUME 2: RIVER BASIN ABOVE DOLORES RIVER Annual Water-Data Report, 1 Oct. 1982 - 30 Sep. 1983
R. C. Ugland, J. T. Steinheimer, J. L. Blattner, and G. Kretschman Jul. 1984 304 p refs Sponsored in part by state of Colorado (PB85-123867; USGS/WRD/HD-84/036; USGS/WDR/CO-83/2) Avail: NTIS HC A14/MF A01 CSCL 08H

Hydrologic conditions; stream flow; chemical quality of the stream flow; ground water; solutes; sediments; water temperature and; water analysis for Colorado are contained. B.G.

N85-20190# Joint Publications Research Service, Arlington, Va.
REMOTE SENSING TECHNOLOGY NOW PLAYING PRACTICAL ROLES
In its China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 1-6 Transl. into ENGLISH from Dianzi Shijie (Peking), no. 5, 1983 p 4-5 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

N85-20220# Joint Publications Research Service, Arlington, Va.
AIRBORNE REMOTE SENSING CCD IMAGING SYSTEM
Ma Zongquan *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-040) 6 Dec. 1984 p 65-72 refs Transl. into ENGLISH from Dianzi Xuebao (Beijing), no. 1, 1984 p 96-99 (For primary document see N85-20219 11-31)
Avail: NTIS HC A07/MF A01

N85-20776# Centre National d'Etudes Spatiales, Paris (France). Applications Program Division
THE SPOT OPERATIONAL REMOTE SENSING SATELLITE SYSTEM: CURRENT STATUS AND PERSPECTIVES
Gerard Brachet *In* AGARD Space System Applications to Tactical Operations Oct. 1984 13 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

N85-20777# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
THE ESA REMOTE SENSING SATELLITE SYSTEM (ERS-1)
Erich H. Velton *In* AGARD Space System Applications to Tactical Operations Oct. 1984 11 p ref (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

N85-20779# National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES RESEARCH USING THE SHUTTLE IMAGING RADAR SYSTEM Abstract Only
R. Monson and Charles Elachi (JPL) *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-20530* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SCREEN PRINTED INTERDIGITATED BACK CONTACT SOLAR CELL Patent
Cosmo R. Baraona, George A. Mazaris, and An-ti Chai, inventors (to NASA) Issued 23 Oct. 1984 6 p Filed 10 Feb. 1983 Supersedes N83-20374 (21 - 10, p 1557)
(NASA-Case-LEW-13414-1; NAS 1.71:LEW-13414-1; US-Patent-4,478,879; US-Patent-Appl-SN-465364; US-Patent-Class-427-85; US-Patent-Class-136-256) Avail: US Patent and Trademark Office CSCL 10A

Interdigitated back contact solar cells are made by screen printing dopant materials onto the back surface of a semiconductor substrate in a pair of interdigitated patterns. These dopant materials are then diffused into the substrate to form junctions having configurations corresponding to these patterns. Contacts having configurations which match the patterns are then applied over the junctions.Official Gazette of the U.S. Patent and Trademark Office

N85-20531*# Florida Univ., Gainesville. Dept. of Electrical Engineering.
SURFACE AND ALLIED STUDIES IN SILICON SOLAR CELLS Quarterly Report, 24 Dec. 1983 - 23 Mar. 1984

F. A. Lindholm 1984 19 p ref Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-956525)
(NASA-CR-174447; DOE/JPL-956525-83/3; JPL-9950-933; NAS 1.26:174447; QR-3) Avail: NTIS HC A02/MF A01 CSCL 10A

Significant improvements were made in the short-circuit current-decay method of measuring the recombination lifetime tau and the back surface recombination velocity S of the quasineutral base of silicon solar cells. The improvements include a circuit implementation that increases the speed of switching from the forward-voltage to the short-circuit conditions. They also include a supplementation of this method by some newly developed techniques employing small-signal admittance as a function of frequency omega. This supplementation is highly effective for determining tau for cases in which the diffusion length L greatly exceeds the base thickness W. Representative results on different solar cells are reported. Some advances made in the understanding of passivation provided by the polysilicon/silicon heterojunction are outlined. Recent measurements demonstrate that S << 10, 000 cm/s derive from this method of passivation. G.L.C.

N85-20532*# Hemlock Semiconductor Corp., Mich.
DEVELOPMENT OF A POLYSILICON PROCESS BASED ON CHEMICAL VAPOR DEPOSITION OF DICHLOROSILANE IN AN ADVANCED SIEMEN'S REACTOR Final Report, 11 Oct. 1982 - 21 May 1983
Arvid N. Arevidson, David H. Sawyer, and David M. Muller 14 Jul. 1983 43 p refs Sponsored by NASA Prepared for JPL, Pasadena, Calif.
(Contract JPL-955533)
(NASA-CR-174445; DOE/JPL-955533-83/08; JPL-9950-965; JPL-Mod-15; NAS 1.26:174445) Avail: NTIS HC A03/MF A01 CSCL 10A

Dichlorosilane (DCS) was used as the feedstock for an advanced decomposition reactor for silicon production. The advanced reactor had a cool bell jar wall temperature, 300 C, when compared to Siemen's reactors previously used for DCS decomposition. Previous reactors had bell jar wall temperatures of approximately 750 C. The cooler wall temperature allows higher DCS flow rates and concentrations. A silicon deposition rate of 2.28 gm/hr-cm was achieved with power consumption of 59 kWh/kg. Interpretation of data suggests that a 2.8 gm/hr-cm deposition rate is possible. Screening of lower cost materials of construction was done as a separate program segment. Stainless Steel (304 and 316), Hastalloy B, Monel 400 and 1010-Carbon Steel were placed individually in an experimental scale reactor. Silicon was deposited from trichlorosilane feedstock. The resultant silicon was analyzed for electrically active and metallic impurities as well as carbon. No material contributed significant amounts of electrically active or metallic impurities, but all contributed carbon. G.L.C.

N85-20533*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EMERGENCY LOCATOR TRANSMITTER (ELT) BATTERIES GUIDANCE AND RECOMMENDATIONS
Radio Technical Commission for Aeronautics 13 Nov. 1984 25 p
(NASA-TM-87415; NAS 1.15:87415; RTCA/DO-188) Avail: NTIS HC A02/MF A01 CSCL 10C

Batteries for use with Emergency locator transmitters are discussed. Types of batteries, real-time activation considerations, encapsulation of cells in a battery pack, cold storage to extend shelf life, and general requirements are among the topics covered. R.J.F.

N85-20534# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SYSTEM SIMULATOR FOR THE SOLAR GENERATOR OF ARTIFICIAL SATELLITES M.S. Thesis - Jun. 1984 [SISTEMA SIMULADOR DO GERADOR SOLAR DE SATELITES ARTIFICIAIS]
Marcos Antonio Bene Sanches Oct. 1984 182 p refs In PORTUGUESE; ENGLISH summary
(INPE-3320-TDL/180) Avail: NTIS HC A09/MF A01

A system for simulating artificial satellite photovoltaic panels is proposed. A digital configuration for the simulator circuit and a scheme for microcomputer monitoring and controlling are presented. The objective is to have a flexible and programmable system in order to reach the needs of a satellite test bank. The circuit stability is developed and finally the preliminary experimental results are presented for the validation of the proposed simulator. Author

N85-20535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LITHIUM COUNTERDOPED SILICON SOLAR CELL Patent Application
Irving Weinberg and H. W. Brandhorst, Jr., inventors (to NASA) Filed 7 Nov. 1984 10 p
(NASA-Case-LEW-14177-1; NAS 1.71:LEW-14177-1; US-Patent-Appl-SN-669140) Avail: NTIS HC A02/MF A01 CSCL 10A

The resistance to radiation damage of an n(+)p boron doped silicon solar cell is improved by lithium counterdoping. Even though lithium is an n-dopant in silicon, the lithium is introduced in small enough quantities so that the cell base remains p-type. The lithium is introduced into the solar cell wafer by implantation of lithium ions whose energy is about 50 keV. After this lithium implantation, the wafer is annealed in a nitrogen atmosphere at 375 C for two hours. NASA

N85-20536# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PERFORMANCE OF THE SERI PARALLEL-PASSAGE DEHUMIDIFIER
Dennis R. Schlepp and Robert Barlow Sep. 1984 65 p refs
(Contract DE-AC02-83CH-10093)
(DE85-000509; SERI/TR-252-1951) Avail: NTIS HC A04/MF A01

The key component in improving the performance of solar desiccant cooling systems is the dehumidifier. A parallel-passage geometry for the desiccant dehumidifier has been identified as meeting key criteria of low pressure drop, high mass transfer efficiency, and compact size. An experimental program to build and test a small-scale prototype of this design was undertaken and the results are presented. Computer models to predict the adsorption/desorption behavior of desiccant dehumidifiers were updated to take into account the geometry of the bed and predict potential system performance using the new component design. The parallel-passage design proved to have high mass transfer effectiveness and low pressure drop over a wide range of test conditions typical of desiccant cooling system operation. The prototype dehumidifier averaged 93% effectiveness at pressure drops of less than 50 Pa at design point conditions. Predictions of system performance using models validated with the experimental data indicate the system thermal coefficients of performance (COPs) of 1.0 to 1.2 and electrical COPs above 8.5 are possible using this design. DOE

N85-20537# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
RESEARCH ON THE BASIC UNDERSTANDING OF HIGH EFFICIENCY IN SILICON SOLAR CELLS Annual Report, 1 Dec. 1982 - 30 Nov. 1983
A. Rohatgi and P. Rai-Choudhury Sep. 1984 125 p refs
(Contract DE-AC02-83CH-10093)
(DE85-000507; SERI/STR-211-2451) Avail: NTIS HC A06/MF A01

Research was undertaken to develop a basic understanding of high-efficiency silicon solar cells and achieve cell efficiencies greater than 17% by employing innovative concepts of material preparation, cell design, and fabrication technology. A theoretical effort to develop models for very high-efficiency cell designs, experimental verification of the designs, and improved understanding of efficiency-limiting mechanisms such as heavy doping

effects and bulk and surface recombination were examined. Research was performed on high-lifetime float-zone silicon, the baseline materials, low-resistivity gallium-doped czochralski silicon, and boron-doped float-zone silicon. DOE

N85-20538*# Spire Corp., Bedford, Mass.
EXCIMER LASER ANNEALING TO FABRICATE LOW COST SOLAR CELLS Quarterly Technical Report, 1 Jul. - 30 Sep. 1984
Anton C. Greenwald Oct. 1984 35 p refs
(Contracts NAS7-100; JPL-956797)
(NASA-CR-174394; DOE/JPL-956797/02; NAS 1.26:174394; QTR-2) Avail: NTIS HC A03/MF A01 CSCL 10A

The objective research is to determine whether or not pulsed excimer laser annealing (PELA) of ion-implanted junctions is a cost effective replacement for diffused junctions of crystalline silicon solar cells. The preliminary economic analysis showed that the use of ion implantation and PELA to fabricate both the front junction and back surface field (BSF) would cost approximately 35 cents per peak watt (Wp), compared to a cost of 15 cents/Wp for a hypothetical baseline diffusion process that it is assumed to yield cells with an average efficiency of 14%. A cost advantage may be attained, however, if the implant-PELA process yields an improvement in the average cell efficiency from 14 to 16%; this improvement would lower the overall cost of the module by about 15 cents/Wp. The technical goal is to develop an optimized PELA process compatible with commercial production, and to demonstrate increased cell efficiency with sufficient product for adequate statistical analysis. It was shown that the laser demonstrated sufficient processing speed for commercial production. Also, the PELA process was optimized for annealing phosphorus implants in polished p-type silicon wafers. DOE

N85-20539# BDM Corp., Albuquerque, N. Mex.
INNOVATIVE SOLAR THERMAL DISH TECHNOLOGY DEVELOPMENT
W. E. Schwinkendorf Sep. 1984 261 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002787; SAND-84-7011) Avail: NTIS HC A12/MF A01

A Cassegrainian point focus solar concentrator system was analyzed and a conceptual design developed. In this system, the receiver is located at the vertex of the primary mirror eliminating limitations of receiver size and weight associated with standard parabolic dish collectors. Disadvantages include increased reflection loss at the secondary mirror and increased beam spread associated with the longer focal length. A non-imaging, trumpet shaped tertiary reflector located at the receiver aperture increases the system efficiency by 15 to 20%. Because the secondary mirror may reach very high temperatures, a reflective film cannot be used as a mirror surface. A thin polished stainless steel stamped into shape and used as the mirror substrate is recommended along with vacuum deposited silver used for the reflecting surface. A transparent coating is then required to protect the silver. Both the secondary and primary mirrors require radial supports on the back surface to minimize deflection under wind loading. The Cassegrainian system is more efficient than the standard dish only at high operation temperatures and for large receivers. The cost per kilowatt into the receiver aperture is less for the Cassegrainian. R.S.F.

N85-20540# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR THERMAL TECHNOLOGY Annual Evaluation Report, fiscal year 1983
Aug. 1984 125 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013029; SERI/PR-253-2188) Avail: NTIS HC A06/MF A01

The accomplishments and progress of the US Department of energy solar thermal technology (STT) program during FY 1983 are documented. The focus of the STT program is research and development leading to the commercial readiness of three primary solar thermal concepts: the central receiver, parabolic dish, and parabolic trough. The hemispherical bowl and salt-gradient solar pond are also being studied. This development effort is complemented by numerous research and planning activities. A brief description of each technology and highlights of the fiscal year's technical activities is given. FY 1983 accomplishments are enumerated and a bibliography, list of contacts, acronyms, and definitions of terms relevant to solar thermal technology and the STT program are included. R.S.F.

N85-20541# Sandia Labs., Albuquerque, N. Mex.
SOL-GEL-DERIVED AR COATINGS FOR SOLAR RECEIVERS
C. S. Ashley and S. T. Reed Sep. 1984 29 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000192; SAND-84-0662) Avail: NTIS HC A03/MF A01

A process for applying sol-gel antireflection (AR) coatings to solar receiver envelopes is investigated. The process consists of applying a porous film which is subsequently etched to achieve the optimum AR effect. The result is a single-layer interference film with a reflectance minimum at 550 nm. The solar transmittance of coated tubes is typically increased to 0.05 to 0.97, as compared with 0.91 for uncoated tubes. Coated tubes showed no significant decrease in solar transmittance after 16 weeks of operation in a parabolic trough collector system. Recommendations are included for process improvement before industrial scale-up. DOE

N85-20542# Sandia Labs., Albuquerque, N. Mex.
PHOTOVOLTAIC SYSTEMS DEVELOPMENT AND EVALUATION PROJECTS INTEGRATION MEETING
M. Thomas Feb. 1984 234 p Meeting held in Albuquerque, N. M., 14 Feb. 1984
(DE84-008530; SAND-84-0106; CONF-840273) Avail: NTIS HC A11/MF A01

Abstracts and visual materials used for the presentations at a photovoltaic systems development meeting are presented along with current contract summaries. The topics of the presentations covered system research, the utility and utility interface, power conditioning development, array field designs, and the evaluation of systems level experiments. An issues forum focused on remaining systems issues for the photovoltaic program. R.S.F.

N85-20543# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
DIGITAL AND COLOR ENERGY MAPS FOR GRAPHIC DISPLAY OF HOURLY DATA
C. Christensen Sep. 1984 10 p refs Presented at the 9th Natl. Passive Solar Conf., Columbus, Ohio, 23 Sep. 1984
(Contract DE-AC02-83CH-10093)
(DE85-000526; SERI/TP-253-2461; CONF-840954-10) Avail: NTIS HC A02/MF A01

The display of hourly data is discussed. Existing methods based on contour plots, design day graphs, and three dimensional surfaces are reviewed, the relationships noted; and the possibilities for extending and combining existing methods described. Problems with using typical weather days are discussed, and new methods based on sequential days are described, including energy maps. Examples of color energy maps are given for three versions of a four zone commercial building, and patterns of energy use are noted and interpreted. The display of hourly data is discussed primarily in terms of simulation results, but the approach is equally applicable to measured data from monitored buildings or any source of hourly data. DOE

N85-20544# United Technologies Research Center, East Hartford, Conn.
FABRICATION OF MONOCRYSTALLINE GaAs SOLAR CELLS UTILIZING NaCl SACRIFICIAL SUBSTRATES
A. J. Shuskus and M. E. Cowher Sep. 1984 69 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013016; SERI/STR-211-2365) Avail: NTIS HC A04/MF A01

Results of research done to establish a process technology for fabricating high-efficiency, thin-film, monocrystalline gallium arsenide solar cells employing sodium chloride as a sacrificial

substrate are reported. Factors limiting the performance of these thin film cells were identified and solutions were sought. Damage to the NaCl substrate surface caused by dust was reduced then the chemical vapor deposition (CVD) laboratory was renovated to a clean room facility. Residual surface defects from chemi-mechanical polishing of the salt substrates were reduced by a vapor etching process developed for NaCl. Preliminary experiments with vapor etching of germanium films also show promise in regard to obtaining an improved Ge-film surface finish. A deposition system also was constructed for low temperature growth of GaAs employing plasma enhancement of the organometallic OM CVD reaction. DOE

N85-20545*# Michigan State Univ., East Lansing. Div. of Engineering Research.
IMPROVED MODELS FOR INCREASING WIND PENETRATION, ECONOMICS AND OPERATING RELIABILITY Final Report
Robert A. Schlueter, Gerald L. Park, G. Sigari, and T. Costi Apr. 1984 198 p refs
(Grant NAG3-399)
(NASA-CR-175538; NAS 1.26:175538; DE85-000865; DOE/NBM-1077) Avail: NTIS HC A09/MF A01 CSCL 10A

The need for wind power prediction in order to enable larger wind power penetrations and improve the economics and reliability of power system operation is discussed. Methods for estimating turbulence and prediction of diurnal wind power prediction are reviewed. A method is presented to predict meteorological event induced wind power variation from measurements of wind speed at reference meteorological towers that encircle all wind turbine clusters and from sites within the wind turbine clusters. The methodology uses a recursive least squares model and requires: (1) detection of even propagation direction; and (2) determination of delays between groups of measurements at reference meteorological towers and those measurements at towers in the array. Proper filtering of the data and methods for switching reference sites and delays for the transition from one frontal system to another are also discussed. The performance of the prediction methodology on data sets from both sites was quite good and indicates one or more hour ahead prediction of wind power for meteorological events is feasible. DOE

N85-20546# Sandia Labs., Albuquerque, N. Mex. Systems Evaluation Project Office.
VALUE OF PV SYSTEMS EXPERIMENTS. VOLUME 1: A PRELIMINARY ASSESSMENT OF THE LESSONS LEARNED FROM NINE INTERMEDIATE-SIZE SYSTEMS
Mike Thomas Aug. 1984 89 p refs
(Contract DE-AC04-76DP-00789)
(DE85-001494; SAND-84-0900/1) Avail: NTIS HC A05/MF A01

Nine intermediate-size photovoltaic (PV) experiments sponsored by the US Department of Energy (DOE) are reviewed. Five variations of PV technology were represented in the experiments: (1) flat plate; (2) flat plate with mirror enhancement; (3) combined photovoltaic/thermal (PV/T) parabolic trough concentrator; (4) combined line-focus Fresnel lens concentrator and thermal; and (5) point-focus Fresnel lens concentrator. The system costs and installation costs are reviewed. The characteristics and electrical performance of the systems are described. Operation and maintenance data are given. DOE

N85-20547# New Mexico Energy Inst., Las Cruces.
WIND GENERATOR FOR SOLAR OFFICE COMPLEX, LUNA VOCATIONAL TECHNICAL INSTITUTE, LAS VEGAS, NEW MEXICO Final Report
Rudi Schoenmackers 8 Mar. 1985 24 p
(DE85-900103; NMERDI-2-69-2210) Avail: NTIS HC A02/MF A01

A 1-kilowatt Bergey wind generator was installed at the solar office complex of the Luna Vocational Technical Institute (LVTI) to supplement the power requirements of the building. The wind system was tied into the utility line at the office complex. Between November 1, 1983 and January 30, 1984, the wind generator produced 199 kilowatt hours, yielding an average capacity factor of 9.1%. The average wind speed over this period was 6.4 mph. Energy output data from this wind generator were compared with manufacturer's data. The data are in good agreement for wind speeds of less than 11 mph, but are lower than the manufacturer's data for wind speeds above 12 mph. The wind generator has and will continue to be used in the instructional program at LVTI. DOE

N85-20548# California Univ., Berkeley. Lawrence Berkeley Lab.
ENVELOPE THERMAL TEST UNIT: TECHNICAL DESCRIPTION
M. P. Modera Jan. 1984 28 p refs Presented at the ASHRAE Symp. on Field Measurements of Heat Transfer in Building Envelopes, Chicago, 27 Jan. 1985
(Contract DE-AC03-76SF-00098)
(DE84-012254; LBL-17173; CONF-850105-1) Avail: NTIS HC A03/MF A01

Although much information is available on the steady-state thermal performance of walls in a laboratory environment, there is little information concerning either the steady-state or dynamic performance of walls in situ. A measurement apparatus, the Envelope Thermal Test Unit (ETTU), developed to measure the in situ thermal performance of walls is described. It includes a description of ETTU's operation, its construction, and the results of tests in the laboratory and in the field. The apparatus is described in detail, including technical specifications of the hardware. The ETTU measurements are compared with predictions made by computer simulation of the heat transfer through the test walls. These comparisons, based upon application of the Simplified Thermal Parameter theory to the interpretation of ETTU measurements, show good agreement with the computer simulations for all of the walls tested, except for the thick concrete wall. It was found that the measurements on the concrete wall were affected by large lateral heat flows. DOE

N85-20549# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ADVANCED GLAZINGS RESEARCH Progress Report, Oct. 1981 - Mar. 1983
D. K. Benson, C. E. Tracy, T. R. Coyle, and K. Masterson Nov. 1984 66 p refs
(Contract DE-AC02-83CH-10093)
(DE85-000539; SERI/PR-255-1894) Avail: NTIS HC A04/MF A01

The objective of this research task was to explore the feasibility of improving the insulating value of cover plates and thereby produce a flat-plate collector that could be operated efficiently at high temperatures. An evacuated, sealed glass cover plate with integral infrared reflective coating was designed and analyzed. Experiments suggest that a laser welding technique could be used to fabricate such a glazing economically. DOE

N85-20550# Thermal Energy Storage, Inc., San Diego, Calif.
DIRECT CONTACT HEAT RECOVERY FROM MOLTEN SALT Final Report
1984 129 p refs
(Contract DE-AC07-83ID-12427)
(DE85-002830; DOE/ID-12427/T1) Avail: NTIS HC A07/MF A01

Technological deficiencies associated with efficient and economical retrieval of heat energy from molten salt systems are addressed. The large latent heat of fusion stored in molten salt hydrates and other candidate phase change materials (PCM) is removed by internal boiling of a volatile heat transfer fluid (HTF). This procedure eliminates the conventional use of submerged heat exchangers which are costly and, in crystallizing salts, ineffective. The thermochemical conditions and material properties that are critical for application of this concept in environments that yield significant energy savings are investigated and defined. DOE

N85-20551# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
APPLICATION OF DIMENSIONAL ANALYSIS TO THE PROBLEM OF SOLAR WIND-MAGNETOSPHERE ENERGY COUPLING

L. F. Bargatze, R. L. McPherron, D. N. Baker, and E. W. Hones, Jr. 1984 5 p refs Presented at Symp. on the Achievements of IMS, Graz, Austria, 26 Jun. 1984 Prepared in cooperation with Los Alamos Scientific Lab., N. Mex.
(Contract W-7405-eng-36)
(DE85-002414; LA-UR-84-3330; CONF-8406150-2) Avail: NTIS HC A02/MF A01

The constraints imposed by dimensional analyses were used to find how the solar wind-magnetosphere energy transfer rate depends upon interplanetary parameters. The analyses assume that only magnetohydrodynamic processes are important in controlling the rate of energy transfer. The study utilized ISEE-3 solar wind observations, the AE index, and U sub T from three 10-day intervals during the IMS: Simple linear regression and histogram techniques were used to find the value of the MHD coupling exponent, alpha, which is consistent with observations of magnetospheric response. Once alpha was estimated, the form of the solar wind energy transfer rate was obtained by substitution into an equation of the interplanetary variables whose exponents depend upon alpha. DOE

N85-20552# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
HIGH-TEMPERATURE, SOLID OXIDE ELECTROLYTE FUEL CELL POWER GENERATION SYSTEM Quarterly Summary Report, 1 Aug. - 3 Oct. 1982
W. Feduska Jan. 1984 27 p refs
(Contract DE-AC02-80ET-17089)
(DE85-002978; DOE/ET-17089/9) Avail: NTIS HC A03/MF A01

Work has proceeded in improving the porous support tube quality through refinements made in the sintering equipment and in processing of the zirconia powder. The lanthanum manganite air electrode is being characterized with respect to its behavior when subjected to the fuel cell component fabrication conditions, to which it is exposed. The large electrochemical vapor deposition (EVD) reactor is nearing completion of assembly. Good 20 cm long interconnection depositions (of proper chemical composition) must still be achieved before test cells can be fabricated. Systems studies are underway in which the solid oxide fuel cell generator is being applied to selected power plant and cogeneration systems to determine their economic worth, based on the present state of cell technology. DOE

N85-20553# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
CONTROL OF LARGE COLLECTOR ARRAYS: THE SSPS EXPERIENCE
R. Carmona and J. G. Martin 1984 44 p refs
(Contract DE-AC04-76DR-00789)
(DE85-001461; DOE/DR-00789/T4; SSPS-TR-4/84) Avail: NTIS HC A03/MF A01

Experience gained in the control of the distributed collector fields at the IEA Small Solar Power Systems project may be of value in the design of control systems for future large arrays. The project experience with analog and digital systems is discussed, as are details on the improvements that were made and the lessons learned. A priority item in this year's efforts on site is the evaluation of the potential for fully automatic operation, with a suitable control algorithm, of a reliable collector array. Preliminary results from dynamic models of the fields in terms of lumped and distributed parameters are given. Adaptive controls are discussed. DOE

N85-20554# Pacific Northwest Lab., Richland, Wash.
GEOTHERMAL INJECTION TREATMENT: PROCESS CHEMISTRY, FIELD EXPERIENCES, AND DESIGN OPTIONS
Cecil H. Kindle, Basil W. Mercer, Rebecca P. Elmore, Steven C. Blair, and David A. Myers Sep. 1984 262 p refs
(Contract DE-AC06-76RL-01830)
(DE85-002873; PNL-4767) Avail: NTIS HC A12/MF A01

The successful development of geothermal reservoirs to generate electric power will require the injection disposal of approximately 700,000 gal/h (2,600,000 1/h) of heat depleted brine for every 50,000 kW of generating capacity. To maintain injectability, the spent brine must be compatible with the receiving formation. The factors that influence this brine/formation compatibility and tests to quantify them are discussed. Some form of treatment will be necessary prior to injection for most situations; the process chemistry involved to avoid and/or accelerate the formation of precipitate particles is also discussed. The treatment processes, either avoidance or controlled precipitation approaches, are described in terms of their principles and demonstrated applications in the geothermal field and, when such experience is limited, in other industrial use. Monitoring techniques for tracking particulate growth, the effect of process parameters on corrosion, and well injectability are presented. Examples of brine injection, preinjection treatment, and recovery from injectivity loss are examined and related to the aspects listed above. DOE

N85-20555# HMJ Corp., Chevy Chase, Md.
PERFORMANCE OF SOLAR THERMAL SYSTEMS WITH LIQUID METAL MHD CONVERSION
E. S. Pierson, W. D. Jackson, G. Berry, M. Petrick, and C. Dennis 15 Jun. 1984 92 p refs
(Contract DE-AC03-83SF-11943)
(DE85-002758; DOE/SF-11943/T1) Avail: NTIS HC A05/MF A01

Liquid metal magnetohydrodynamic conversion (LMMHD) is found to be compatible with concentrating solar receivers employing a liquid metal as a heat transfer medium and offers significant increases in the system thermal efficiency over the 33% considered attainable with conventional turbo-machinery. There are two candidate liquid metals - sodium and lithium. With sodium at a temperature of 1150 F (922 K), the maximum calculated efficiency is 39.5% while with lithium at 1400 F (1033 K) a peak efficiency for 46.5% is predicted. Up to two percentage points may be added by temperature increase and/or parameter limit relaxation in the sodium case. The sodium steam heat exchanger is eliminated in liquid metal systems. Where LMMHD systems employ the same working fluid as the solar receiver, no recirculating pump is required as pumping power is provided directly by the cycle. For sodium, coupling with either a gas turbine or a steam turbine is beneficial and provides similar performance. With lithium, the gas turbine cycle is clearly superior. DOE

N85-20556# Argonne National Lab., Ill.
THEORETICAL ANALYSIS OF CONDENSATION IN THE PRESENCE OF NONCONDENSABLE GASES AS APPLIED TO OPEN CYCLE OTEC CONDENSERS
C. B. Panchal and K. J. Bell (Oklahoma State Univ., Stillwater) 1984 16 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-015809; CONF-841201-12) Avail: NTIS HC A02/MF A01

The open cycle ocean thermal energy conversion condenser was analyzed from a theoretical standpoint. Interfacial temperature profiles and gas concentrations in the axial direction were determined, and their effects on the rate of condensation studied. For the analysis, the vapor phase was modeled using diffusion equations for simultaneous heat and mass transfer processes, while the liquid phase was modeled using a falling film analysis. This analysis was then applied to a plate fin condenser, and the effect of varying the fin density along the condenser lengths was investigated. General engineering aspects of heat exchanger design are discussed for condensation of vapor mixtures in the presence of noncondensable gases. DOE

N85-20557# National Bureau of Standards, Washington, D.C. National Engineering Lab.
SHORT DURATION WINTER-TIME PERFORMANCES OF DIFFERENT PASSIVE SOLAR SYSTEMS
Bal M. Mahajan Aug. 1984 57 p refs
(Contract DE-AI01-76PR-06010)
(DE85-000850; NBSIR-84-2930) Avail: NTIS HC A04/MF A01

The thermal performance of three full-sized adjoining rooms, each with a different south-facing passive feature, were monitored for two short periods during January to February and February to

March. These rooms are Trombe wall cell, a control cell, and a direct gain cell in the NBS passive solar test facility. Data from 436 sensors were collected, including auxiliary energy supplied, continuous air infiltration, temperatures, solar radiation, and wind speed and direction. The test facility, instrumentation, data acquisition system, and procedures and test conditions are described. The performance of the three test cells are compared along with the values of average, controidal, and maximum and minimum air temperatures in the direct gain and Trombe wall cells. Results indicate that regardless of the magnitude of the stratification, the temperature recorded by the sensor placed in the vicinity of the centroid of the cell was nearly equal to the average value of the cell air temperature. R.S.F.

N85-20558# Whetstone Branch Living School, Ferrum, Va.
VERTICAL SOLAR LOUVER PROJECT Final Technical Report
C. James Bier 15 Sep. 1984 11 p refs
(Contract DE-FG01-82CE-15135)
(DE84-017335; DOE/CE-15135/T1) Avail: NTIS HC A02/MF A01

The thermal network analysis computer program MICROPAS was used to analyze Vertical Solar Louvers and other reference solar designs in eight selected climates. The results have been used to generate a set of correlation coefficients for use in performance predictions by the Solar Load Ratio method. At low mass VSL were shown to be superior to ordinary direct gain and equal to the trombe wall systems in energy savings. The energy savings advantage of VSL over direct gain disappears in comparable systems of high mass. Identical solar water tanks of oval cross section were compared in the water wall and VSL configurations. DOE

N85-20559# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
HIGH PERFORMANCE SOLAR DESICCANT COOLING SYSTEM: PERFORMANCE EVALUATION AND RESEARCH RECOMMENDATIONS
Dennis R. Schlepp and Kenneth J. Schultz Sep. 1984 51 p refs
(Contract DE-AC02-83CH-10093)
(DE85-000508; SERI/TR-252-2497) Avail: NTIS HC A04/MF A01

The current status of solar desiccant cooling was assessed and recommendations were made for continued research to develop high performance systems competitive with conventional cooling systems. Solid desiccant, liquid desiccant, and hybrid systems combining desiccant dehumidifiers with vapor compressor units are considered. Currently, all desiccant systems fall somewhat short of being competitive with conventional systems. Hybrid systems appear to have the greatest potential in the short term. Solid systems are close to meeting performance goals. Development of high performance solid desiccant dehumidifiers based on parallel passage designs should be pursued. Liquid system collector/generators and efficient absorbers should receive attention. Model development is also indicated. Continued development by hybrid systems is directly tied to the above work. DOE

N85-20560# Pacific Northwest Lab., Richland, Wash.
UNDERGROUND PUMPED HYDROELECTRIC STORAGE
R. D. Allen, T. J. Doherty, and L. D. Kannberg Jul. 1984 72 p refs
(Contract DE-AC06-76RL-01830)
(DE85-000288; PNL-5142) Avail: NTIS HC A04/MF A01

Underground pumped hydroelectric energy storage was conceived as a modification of surface pumped storage to eliminate dependence upon fortuitous topography, provide higher hydraulic heads, and reduce environmental concerns. A UPHS plant offers substantial savings in investment cost over coal-fired cycling plants and savings in system production costs over gas turbines. Potential location near load centers lowers transmission costs and line losses. Environmental impact is less than that for a coal-fired cycling plant. The inherent benefits include those of all pumped storage (i.e., rapid load response, emergency capacity, improvement in efficiency as pumps improve, and capacity for voltage regulation). A UPHS plant would be powered by either a coal-fired or nuclear baseload plant. The economic capacity of a UPHS plant would be in the range of 1000 to 3000 MW. This storage level is compatible with the load-velocity requirements of a greater metropolitan area with population of 1 million or more. DOE

N85-20561# Arizona Public Service Co., Phoenix.
PHASE 2 FABRICATION AND CONSTRUCTION OF THE SKY HARBOR AIRPORT, SOLAR PHOTOVOLTAIC CONCENTRATOR PROJECT Progress Report, 11 Mar. 1980 - 30 Jun. 1982
W. J. McGuirk Jan. 1984 60 p
(Contract DE-AC04-80ET-20624)
(DE85-000019; DOE/ET-20624/1) Avail: NTIS HC A04/MF A01

The activities of phase 2 of the Sky Harbor Airport solar photovoltaic project are documented for the period from March 11, 1980 to June 30, 1982. The work was accomplished under contract number DE-AC04-80ET20624 as part of DOE's PRDA EG-78-D-04-0035 program or the evaluation of concentrating photovoltaic application experiments. The phase 2 effort included evaluation of prototype Motorola concentrator modules, a critical review of Fresnel lens concentrator designs, selection of an alternative Fresnel lens concentrator design by Martin Marietta, and construction and initial operation of the 225 kW system. DOE

N85-20562# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. of Physics.
THE RELEVANCE OF AVERAGING PERIOD TO WIND POWER MEASUREMENTS AND EFFICIENCY OF WIND ENERGY CONVERSION SYSTEMS (WECS)
H. T. Mengelkamp 1984 12 p refs Presented at 3rd Intern. Conf. on Solar Energy and Exhibition, Istanbul, 25-27 Jun. 1984 Submitted for publication
(GKSS-84-E-35; ISSN-0344-9629) Avail: NTIS HC A02/MF A01

The 10 min averages of wind speed, wind speed cubed, and power output are used for the determination of power curves and power coefficient of wind energy conversion systems and turbulence intensity. It is shown that the turbulent part of the air flow at the Pellworm (Germany) test field contains 16% of the mean flow energy. Neglecting the turbulent part in determining the power coefficient or power curve leads to an error in the calculation of the mean energy output at locations with a different turbulence intensity. Averaging the third power of the instantaneous wind speed is recommended. Author (ESA)

N85-20563# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. of Physics.
THE TEMPERATURE OF A GLASS-ENCAPSULATED SOLAR CELL ESTIMATED FROM AMBIENT AIR TEMPERATURE AND GLOBAL RADIATION
H. T. Mengelkamp and U. Nemsmann (AEG Telefunken, Wedel, West Germany) 1984 9 p refs Presented at 3rd Intern. Conf. on Solar Energy and Exhibition, Istanbul, 25-27 Jun. 1984 Submitted for publication
(GKSS-84-E-36; ISSN-0344-9629) Avail: NTIS HC A02/MF A01

During a 10 month experiment the temperature, open circuit voltage, and short circuit current of a glass encapsulated silicon solar cell were measured along with ambient air temperature, solar radiation, and wind speed. The relation of cell to air temperature is found to be a linear function of global radiation with temperature-depending coefficients. The cooling effect of wind speed is of minor importance. Author (ESA)

N85-20564# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
OCEAN ENERGY SYSTEMS Quarterly Report
Apr. 1984 27 p refs
(PB85-110856; JHU/APL-OQR-84-1) Avail: NTIS HC A03/MF A01 CSCL 10A

The Johns Hopkins University Applied Physics Laboratory is engaged in developing ocean thermal energy conversion (OTEC) systems that are to provide synthetic fuels or an energy intensive product such as ammonia or aluminum. The work also includes

assessment and design concepts for hybrid plants, such as geothermal-OTEC plants. The laboratory also has a technical advisory role with respect to DOE/DOET's management of the preliminary design activity of an industry team headed by Ocean Thermal Corporation that is designing an OTEC pilot plant that could be built in shallow water off the shore of Oahu, Hawaii. In addition, the Laboratory is now taking part in a program to evaluate and test the pneumatic wave energy conversion system, an ocean energy device consisting of a turbine that is air driven as a result of wave action in a chamber. R.S.F.

N85-20565# Alabama Univ., Huntsville. Environmental and Energy Center.
ELECTRICAL AND THERMAL PERFORMANCE DURING CHARGING AND DISCHARGING A PHASE 1 GEL CELL BATTERY Final Report
Dieter Nowak 23 Jul. 1984 51 p Prepared for Aerospace Corp., Washington, D.C.
(PB85-114312; UAH-408) Avail: NTIS HC A04/MF A01 CSCL 10A

Tests were performed on a 96V immobilized-electrolyte sealed lead-acid battery pack. The test battery was comprised of Globe GC-6-1500 battery modules. The objectives were to assess the nature and extent of problems encountered by the test battery at various operating temperatures, and to provide an engineering data base to help eliminate the identified problems. The performance of the test battery was comparable to flooded-electrolyte golfcart batteries. The performance of the test battery, over operating temperatures of 0 F to 130 F, indicated that it could perform satisfactorily in electric vehicles, and yield about 10% less vehicle range than high-performance flooded electric vehicle batteries. GRA

N85-20566# Stanford Univ., Calif. Dept. of Chemistry.
ENERGY TRANSFER AND PHOTOCHEMISTRY IN BIOMIMETIC SOLAR CONVERSION Annual Report, Oct. 1983 - Sep. 1984
S. G. Boxer 30 Aug. 1984 15 p refs Sponsored by Gas Research Inst.
(PB85-129112; GRI-84/0174) Avail: NTIS HC A02/MF A01 CSCL 07E

The theoretically predicted orientation dependence of electronic energy transfer was tested in a completely defined, three dimensional array of chromophores. Steady state and time resolved fluorescence measurements demonstrate unambiquously that singlet energy transfer is orientation dependent. Quantitative analysis yields the orientation of the transition dipole moment for the first excited state of chlorophyll. Long range electron transfer was observed from an encapsulated chromophore excited singlet state to electron acceptors in solution. A rigidly connected donor/acceptor pair was designed and synthesized for studies of electron transfer mechanisms. An ultrasensitive apparatus was constructed and tested to measure magnetic field effects on luminescent recombination in amorphous Si. GRA

N85-20567# National Bureau of Standards, Gaithersburg, Md. Center for Building Technology.
EVALUATION OF INFRARED REFLECTANCE AS A TECHNIQUE FOR MEASURING ABSORBER MATERIALS DEGRADATION
David Waksman and Willard E. Roberts Sep. 1984 47 p refs Sponsored in part by DOE
(PB85-108488; NBSIR-84-2916) Avail: NTIS HC A03/MF A01 CSCL 10A

Current ASTM standards concerned with the durability and reliability of absorptive coatings rely on integrated solar absorptance and emittance as the primary methods for assessing changes in absorber optical performance resulting from environmental exposure. Work was undertaken to determine if infrared reflectance measurements are a more sensitive technique for detecting absorber materials degradation. Spectral measurements were made to identify factors that could affect the reproducibility of infrared reflectance measurements and to compare their ability to detect changes with currently used methods for absorber materials. Recommendations are made concerning the use and limitations of infrared reflectance measurements for this purpose. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-20568# Committee on Science and Technology (U. S. House).
ENVIRONMENTAL MONITORING IMPROVEMENT ACT
Washington GPO 1985 192 p Hearing before the Subcomm. on Nat. Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 98th Congr., 2nd Sess., No. 138, 28 Mar. 1984
(GPO-39-742) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

Hearings were conducted and testimony heard concerning legislation to improve environmental monitoring procedures by the EPA and other responsible groups. Of major concern is a proposal to create a commission to act as the prime coordinating body for the nation's environmental monitoring efforts. Its charge will be to define clearly the operational changes and administrating coordination necessary to assure that cost effective, statistically sound data are available to support environmental policy making in this country. G.L.C.

N85-20569# Committee on Science and Technology (U. S. House).
CARBON DIOXIDE AND THE GREENHOUSE EFFECT
Washington GPO 1984 204 p refs Hearing before the Subcomm. on Invest. and Oversight and the Subcomm. on Natural Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 98th Congr., 2d Sess., No. 119, 28 Feb. 1984
(GPO-39-043) Avail: Subcommittee on Investigations and Oversight

Hearings were held to examine when the impacts of the greenhouse effect would begin to be seen, how severe these impacts will be, and how the government's research programs on this phenomenon will proceed. A review of the Department of Energy's research program was initiated. A.S.B.

N85-20570# Argonne National Lab., Ill.
EVALUATION OF RECENT SO/SUB X/AND NO/SUB X/ EMISSION INVENTORIES
D. M. Rote and K. C. Chun May 1984 73 p refs
(Contract W-31-109-eng-38)
(DE85-002649; ANL/ES-142) Avail: NTIS HC A04/MF A01

Several recent emission inventories are examined in detail with particular emphasis on analyzing estimates of NO sub x and SO sub x emissions. The NEDS, NAPAP, SURE, MAP3S, NECAME, and WG3B inventories are described and compared qualitatively in terms of their time frames, geographic coverages, pollutants inventoried, data sources, emission factors, and approaches to spatial and temporal resolution. Improvements over earlier inventories and remaining limitations are also discussed. The inventories are also compared quantitatively at the national level by major source category and fuel type, with emphasis on natural-gas-fired sources. Discrepancies are noted and discussed. Sources of error and uncertainty in emission inventories are described in qualitative terms. Also, procedures for quantitatively expressing and evaluating uncertainty are described in detail, after which selected results obtained through error analysis of the various emission inventories are commented on briefly. Several source categories of special interest to the natural gas utility industry, including those of natural gas appliances and certain industrial sources, are examined in some detail. R.S.F.

N85-20571# Argonne National Lab., Ill.
STUDY OF POLLUTANT DISPERSION IN AN URBAN STREET CANYON
F. T. DePaul and C. M. Sheih Oct. 1984 90 p refs
(Contract W-31-109-eng-38)
(DE85-002648; ANL/ER-84-1) Avail: NTIS HC A05/MF A01

Pollutant dispersion from an urban street canyon was studied

to determine the process by which pollutants emitted at street level are transported from the canyon and to quantify the net rate of pollutant exchange between the canyon and the upper air. Mean wind velocities were determined by analyzing the trajectories of tracer balloons. The trajectories indicted the presence of a primary vortex cell. The measurements also suggest that while pollutant mixing within the canyon occurs rapidly by mean wind advection, the final transport of material normal to the roof-level plane is accomplished by turbulent motions. To determine the net rate of pollutant exchange between the street canyon and upper air, a tracer study was performed by releasing a controlled amount of SF6 gas near the street. From the measurement of tracer decay, retention times, defined as the length of time for a pollutant concentration to reduce to 1/E of its original value, were computed. The retention times were found to be of the order of minutes for ambient winds between 1.7 and 4.5 m/s. R.S.F.

N85-20572# Pacific Northwest Lab., Richland, Wash.
COMPARISON OF MESOI ATMOSPHERIC DISPERSION ESTIMATES WITH DATA AND ESTIMATES FROM OTHER MODELS
J. V. Ramsdell, C. S. Glantz, and G. I. Andrews Oct. 1984 13 p refs Presented at the DOE Model Validation Workshop, Charleston, S.C., 23 Oct. 1984
(Contract DE-AC06-76RL-01830)
(DE85-002372; PNL-SA-12670; CONF-8410165-2) Avail: NTIS HC A02/MF A01

The magnitudes and positions of maximum short-term concentrations estimated by the MESOI and straight-line Gaussian dispersion models are compared with the magnitudes and positions of concentration maxima observed following 14 tracer releases at the DOE Savannah River Laboratory. Diffusion classes were selected using NRC temperature difference and sigma theta criteria. The models' performances are compared statistically using analysis of variance and paired t-tests. The best performance is by the MESOI model using the split-sigma approach to selection of diffusion classes; the geometric mean ratio between the model's concentration predictions and the observed concentrations is 1.1. The split-sigma approach to selecting diffusion classes is found to be significantly better than the temperature difference approach. DOE

N85-20573# Oak Ridge National Lab., Tenn.
MODELS AND PARAMETERS FOR ENVIRONMENTAL RADIOLOGICAL ASSESSMENTS
Charles W. Miller, ed. 1984 156 p refs
(Contract W-7405-eng-26)
(DE81-027154; DOE/TIC-11468; ISBN-0-87079-517-1; LC-84-14255) Avail: NTIS HC A08/MF A01

A unified compilation of models and parameters is presented that is appropriate for assessing the impact of radioactive discharges to the environment. Models examined include those developed for the prediction of atmospheric and hydrologic transport and deposition, for terrestrial and aquatic food-chain bioaccumulation, and for internal and external dosimetry. DOE

N85-20574# Brookhaven National Lab., Upton, N. Y. Environmental Chemistry Div.
THE CONCENTRATION OF SULFATE IN BROKEN CLOUD LAYERS
H. M. tenBrink (Netherlands Energy Research Foundation, Petten), P. H. Daum, and S. E. Schwartz 1984 11 p Presented at the 3rd European Symp. on the Phys.-Chem. Behavior of Atmospheric Pollutants, Varese, Italy, 11-13 Apr. 1984 Submitted for publication
(Contract DE-AC02-76CH-00016)
(DE85-000228; BNL-35206; CONF-8404191-2) Avail: NTIS HC A02/MF A01

The concentration of sulfate aerosol in the supersaturated and cloud free regions of broken cloud layers was determined via aircraft flights. Measurements were performed using two real-time monitors: a sensitivity enhanced flame photometer detector for sulfur and an integrating nephelometer. It is shown that the light scattering coefficient as measured by the nephelometer can be translated to a sulfate concentration. Typically the concentration of sulfate present as interstitial aerosol in the supersaturated cloud regions was found to be less than 10% of aerosol sulfate in the adjacent cloud-free zones. When it is assumed that the origin of the supersaturated air in the cloud layer and the cloud-free air are of identical origin the observed difference in the sulfate concentration is a direct measure of the scavenging efficiency for sulfate aerosol. From a comparison of the concentration of sulfate in the collected cloud water and the concentratin of sulfate in the cloud interstitial air indications were found that in-cloud oxidation of sulfur dioxide occurred. It was furthermore observed that the size of the hydroscopic sulfate particles in the cloud zones were substantially larger than the size of these particles after drying. DOE

N85-20575# Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
METEOROLOGICAL SUPPORT FOR THE 1983 DEEP CREEK, MARYLAND EXPERIMENT Final Report, 18 Jul. 1983 - 31 Mar. 1984
P. J. Samson, M. E. Fernau, J. M. Masters, and D. A. Johnson 1984 152 p refs
(Grant DE-FG22-83PC-61252)
(DE85-002616; DOE/PC-61252/T1) Avail: NTIS HC A08/MF A01

Plume studies were performed on the transport, transformation, and dispersion of nitric acid, nitrates, and ammonia in the first hours of emission. The study was performed at Deep Creek, Maryland during August, 1983. Nitric acid levels in the aerosol seem to be high if upper air flow is from the west or northwest, as long as the air had long residence times over the Ohio, Kentucky, Indiana or Michigan areas. Some exceptions to this were seen. Flow from the northeast was associated with lower values or nitric acid, even if the air stagnated over the area to the immediate east or northeast of Deep Creek. There also appears to be a correlation between rain events and a subsequent lowering of nitric acid levels. Absolute concentrations of particulate nitrate were generally low during the first half of the month and high the second half of the month. This dichotomy is not obviously related to a major shift in wind patterns over the month. The lowest values of all four components generally occurred with transport from the northeast or east or with high wind speeds. DOE

N85-20576# Illinois Univ., Urbana. Dept. of Plant Biology.
EFFECT OF ELEVATED ATMOSPHERIC CO2 ON PLANT COMMUNITIES Final Report
Fakhri A. Bazzaz Oct. 1984 20 p refs
(Contract DE-AC02-77EV-04329)
(DE85-001810; DOE/EV-04329/4) Avail: NTIS HC A02/MF A01

The effects of elevated atmospheric carbon dioxide on communities of colonizing annual plants, crop plants, and deciduous forest trees were studied. Differential effects were observed on different species with regard to growth, biomass, phenology, resource allocation, photosynthesis, water use efficiency, flowering, and fruiting. It is concluded that competitive relations among plants are likely to change as global atmospheric CO2 increases, and that therefore there will be long term changes in the composition of natural communities. More research is necessary before any but the very broadest conclusions can be made about what direction these community changes are likely to take. DOE

N85-20577# Institut fuer Weltraumforschung, Graz (Austria).
ENVIRONMENTAL EFFECTS OF SPACE ACTIVITIES
S. J. Bauer (Technische Universitaet, Graz) Sep. 1984 38 p refs
Avail: NTIS HC A03/MF A01

Environmental effects of atmospheric chemical releases and large scale launch and orbital operations are discussed. Whereas the past and anticipated use of chemical releases for scientific experiments, and the launch and orbital activities of past and present propulsion systems seem to have no significant environmental effects, this may not be true for the proposed Solar Power Satellite Program. The launch and personnel transfer vehicles would

inject unprecedented amounts of exhaust (largely water and its dissociation products) into the atmosphere and magnetosphere. The argon ion engines of the cargo orbit transfer vehicles propellant mass corresponds to a number of argon ions injected into the magnetosphere that equals the present content of magnetospheric ions. Ions and neutrals from orbit transfer vehicles are expected to have significant consequences for the magnetospheric environment. Author (ESA)

N85-20578# Centro Informazioni Studi Esperienze, Milan (Italy).
EXAMPLES OF ENVIRONMENT SERVICES: HYDROLOGICAL AND POLLUTION MEASUREMENTS IN THE PO RIVER (ITALY) [ESEMPI DI SERVIZI PER L'AMBIENTE: MISURE IDROLOGICHE E DI INQUINAMENTO NEL FUME PO]
E. Bazzano and F. Dallavalle 1984 13 p In ITALIAN Presented at SITEL 84 Conv. il Disinqwnamento del Po, Bologna, 18 May 1984
(CISE-2299) Avail: NTIS HC A02/MF A01

Flow measurements of the river Po carried out eight times per year in nine sections of the river are described. The thermal mapping of the sectors affected by thermoelectricity stations is also discussed. The pollution measurements use field direct concentration systems, inorganic ion exchanger columns and radioactivity measurement devices. Author (ESA)

N85-20579# Lockheed Engineering and Management Services Co., Inc., Las Vegas, Nev. Environmental Programs.
MONITORING APPROACHES FOR ASSESSING QUALITY OF HIGH ALTITUDE LAKES: COLORADO FLAT TOPS WILDERNESS AREA
Barry P. Baldigo and John R. Baker Oct. 1984 213 p refs
(Contract EPA-68-03-3050)
(PB85-117232; EPA-600/7-84-088) Avail: NTIS HC A10/MF A01 CSCL 08H

The sampling results for three lakes in the Flat Tops Wilderness Area of Colorado are summarized. Ned Wilson, Oyster and Upper Island Lakes were surveyed. They are representative of the range of sensitive lakes in the area threatened by acid deposition. Biological and chemical lake characteristics are assessed to determine efficient monitoring approaches for the three index lakes and similar lakes of the area. GRA

N85-20580# JRB Associates, McLean, Va.
IMPROVED TECHNIQUES FOR REMOVAL OF SEDIMENTS CONTAMINATED WITH HAZARDOUS MATERIALS
R. S. Wetzel, A. N. Tafuri (EPA, Edison, N.J.), and J. R. Sinclair (Coast Guard, Washington, D.C.) Oct. 1984 14 p refs Sponsored in part by Municipal Environmental Research Lab.
(Contract EPA-68-03-3113)
(PB85-116093; EPA-600/D-84-253) Avail: NTIS HC A02/MF A01 CSCL 13B

Realizing the need to improve the capabilities of response personnel in dealing with cleanup operations involving contaminated sediments, the U.S. Coast Guard and the U.S. Environmental Protection Agency jointly funded a research project to: identify, characterize, and classify chemicals that sink and are amenable to recovery by dredging and/or other techniques such as in-situ treatment; and review the state-of-the-art of contaminated sediment management technology to document and identify improved methodologies for handling and disposing of contaminated sediments. Author (GRA)

N85-20581# Interagency Task Force on Acid Precipitation, Washington, D.C.
NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM. REPORT TO THE PRESIDENT AND CONGRESS (1983) Annual Report
1983 71 p refs
(PB85-116713) Avail: NTIS HC A04/MF A01 CSCL 13A

The Annual Report to the President and Congress outlines the specific accomplishments of the National Program during the last year (FY-1983), summarizes the current state of scientific knowledge for decisionmakers, and describes the outlook for continued progress by the federally sponsored research effort on acid deposition. Information on acid deposition has many different and important uses, and the National Program thus has a diverse clientele. Primary is, of course, on meeting the urgent needs of the Congress and Executive Branch decisionmakers who are charged with developing sound environmental policies for the Nation. Most attention in the public debate has focused on information relevant to determining regulatory policy about sulfur dioxide and, to a lesser degree, nitrogen oxide emissions. GRA

N85-20582# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Criteria and Assessment Office.
AIR QUALITY FOR OZONE AND OTHER PHOTOCHEMICAL OXIDANTS. EXTERNAL REVIEW DRAFT, VOLUME 1
D. E. Gardner (Northrop Services, Inc., Research Triangle Park, N.C.), J. H. B. Garner, J. A. Graham, J. A. Hodgeson (Louisiana State Univ., Baton Rouge), T. J. Kulle (Maryland Univ., Baltimore), James A. Raub, Beverly E. Tilton, and David E. Tingey (Environmental Research Lab., Corvallis, Oreg.) Jul. 1984 219 p refs 4 Vol.
(PB85-126035; EPA-600/8-84-020A-1-Vol-1) Avail: NTIS HC A10/MF A01; also available in set of 5 reports HC E99 as PB85-126027 CSCL 13B

Scientific information is presented and evaluated relative to the health and welfare effects associated with exposure to ozone and other photochemical oxidants. Though not intended as a complete, detailed literature review, the document covers pertinent literature through 1983 and early 1984. Data on health and welfare effects are emphasized but additional information is provided for understanding the nature of the oxidant pollution problem and for evaluating the reliability of effects data as well as their relevance to potential exposures to ozone and other photochemical oxidants at concentrations occurring in ambient air. Author (GRA)

N85-20583# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Criteria and Assessment Office.
AIR QUALITY CRITERIA FOR OZONE AND OTHER PHOTOCHEMICAL OXIDANTS. EXTERNAL REVIEW DRAFT, VOLUME 5
Donald H. Horstman, Steven M. Horvath (California Univ., Santa Barbara), and James A. Raub Jul. 1984 295 p refs 5 Vol.
(PB85-126076-Vol-5; EPA-600/8-84-030A-5) Avail: NTIS HC A13/MF A01 CSCL 13B

In 1977 the National Research Council report on ozone and other photochemical oxidants stated a need for comprehensive human experimental studies that were carefully controlled and documented to ensure reproducibility. The available data on controlled studies through 1975 were limited to some 20 publications. Nonetheless, this data base represented a substantial increase above the information available prior to 1970, and it became evident that exposure to O3 at low ambient concentrations resulted in some degree of pulmonary dysfunction. Tables have been provided to give an overview of the studies discussed in the text and provide some additional information about measurement techniques and exposure protocols. GRA

N85-20584# Systems Applications, Inc., San Rafael, Calif.
CONTINUED RESEARCH IN MESOSCALE AIR POLLUTION SIMULATION MODELING. VOLUME 7. MATHEMATICAL MODELING OF URBAN AEROSOL DYNAMICS Final Report, Oct. 1979 - Jul. 1982
T. N. Jerskey, L. E. Reid, J. H. Seinfeld (California Inst. of Technology), and F. Gelbard (California Inst. of Technology) Dec. 1984 203 p refs
(Contract EPA-68-02-2216)
(PB85-137388; EPA-600/3-84-095C) Avail: NTIS HC A10/MF A01 CSCL 13B

A simplified model of the dynamics of photochemical aerosols is developed, and initial applications are presented. The model, which can be incorporated in or coupled to a photochemical air quality simulation model, takes into consideration the emissions of particles with diameters of 0.01 to 1.0 micrometer and their growth in this size range by the formation of secondary aerosol.

The formation of particulate matter is assumed to occur in two stages; condensable material first forms in the gas phase and then diffuses to the particles. A pseudo-steady-state is assumed in which the rate of formation of condensable material in the gas phase is set equal to the rate at which condensation occurs on particles. Author (GRA)

N85-20585# Systems Applications, Inc., San Rafael, Calif.
CONTINUED RESEARCH IN MESOSCALE AIR POLLUTION SIMULATION MODELING. VOLUME 5: REFINEMENTS IN NUMERICAL ANALYSIS, TRANSPORT, CHEMISTRY, AND POLLUTANT REMOVAL Final Report, Oct. 1979 - Jul. 1982
J. P. Killus, J. P. Meyer, G. E. Durran, G. E. Anderson, and T. N. Jerskey Dec. 1984 238 p refs 7 Vol.
(Contract EPA-68-02-2216)
(PB85-137362; EPA-600/3-84-095A) Avail: NTIS HC A11/MF A01 CSCL 13B

Two numerical integration methods which have features that provide significant improvements over the technique originally embedded in the airshed model were evaluated. Of particular concern was the treatment of horizontal transport. In the evaluation of the schemes, the predictions resulting from the SHASTA method differed on more than about 20% from those generated using the original method. The SHASTA was the better blend of computational speed and minimum error propagation. An objective analysis technique for obtaining a gridded, time-varying, fully three-dimensional wind field for the airshed model from available measurement was developed. The technique accounts for urban heat island effects and should be directly applicable to relatively flat areas. A 42-step chemical kinetic mechanism for describing the chemical transformations of organics, NOx, O3, and SO2 and the production of sulfate, nitrate, and organic aerosols is presented. A unique feature of this mechanism is the explicit consideration given to the carbon bonds making up each organic molecule.
GRA

N85-20586# Environmental Protection Agency, Research Triangle Park, N.C. Quality Assurance Div.
NATIONAL PERFORMANCE AUDIT PROGRAM AMBIENT AIR AUDITS OF ANALYTICAL PROFICIENCY
Robert L. Lampe, Blaine F. Parr, Gregory Pratt, Oscar L. Dowler, and William J. Mitchell Oct. 1984 64 p refs
(PB85-138204; EPA-600/4-84-077) Avail: NTIS HC A04/MF A01 CSCL 14B

Results are presented of the U.S. Environmental Protection Agency's 1983 National Audit Program by pollutant and by analytical methods. Semiannual audits were conducted for SO2 and NO2 (bubbler methods), Pb, NO3(-) and SO4(=) (filter strips) and CO (continuous monitors). One audit was conducted on high-volume flow rate. Continuous SO2 monitors were audited throughout the year, such that no monitor was audited more than once. This was the first year that acid rain audits were conducted for U.S. laboratories -- approximately 30 laboratories participated in each semiannual acid rain audit. Author (GRA)

N85-19965# University of Northern Illinois, De Kalb. Dept. of Biological Sciences.
SUCCESSFUL CONTROL OF GULLS AND OTHER BIRDS AT A SANITARY LANDFILL
William E. Southern and Linda K. Southern *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 231-240 (For primary document see N85-19938 11-03)
(AD-P004198) Avail: NTIS HC A16/MF A01 CSCL 13/2

N85-19966# LGL Ltd., Toronto (Ontario).
EFFECTIVENESS OF AN OVERHEAD WIRE BARRIER IN DETERRING GULLS FROM FEEDING AT A SANITARY LANDFILL
Margaret A. McLaren, Ross E. Harris, and W. John Richardson *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 241-252 refs (For primary document see N85-19938 11-03)
(AD-P004199) Avail: NTIS HC A16/MF A01 CSCL 13/1

N85-19967# Citadel Coll., Charleston, S.C. Dept. of Biology.
EFFECTIVENESS OF AN OVERHEAD WIRE BARRIER SYSTEM IN REDUCING GULL USE AT THE BFI JEDBURG SANITARY LANDFILL, BERKELEY AND DORCHESTER COUNTIES, SOUTH CAROLINA
Dennis M. Forsythe and Tim W. Austin *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 253-264 refs (For primary document see N85-19938 11-03)
(AD-P004200) Avail: NTIS HC A16/MF A01 CSCL 13/2

N85-19968# Canadian Wildlife Service, Ottawa (Ontario).
EVALUATION OF EFFECTIVENESS OF BIRD SCARING OPERATIONS AT A SANITARY LANDFILL SITE NEAR CFB TRENTON, ONTARIO, CANADA
Chris Risley and Hans Blokpoel *In* PEER Consultants, Inc. Wildlife Hazards to Aircraft Conf. and Training Workshop May 1984 p 265-274 refs (For primary document see N85-19938 11-03)
(AD-P004201) Avail: NTIS HC A16/MF A01 CSCL 13/2

N85-20196# Joint Publications Research Service, Arlington, Va.
ATMOSPHERIC DIFFUSION IN HILLY REGION ON MIDDLE REACHES OF THE CHANG JIANG Abstract Only
In its China Rept.: Sci. and Technol. (JPRS-CST-84-026) 18 Sep. 1984 p 29-31 Transl. into ENGLISH from Fushe Fang (Taiyuan, China), v. 4, no. 2, 10 Mar. 1984 p 81-89 (For primary document see N85-20189 11-31)
Avail: NTIS HC A03/MF A01

N85-20452*# Technische Univ., Graz (Austria). Dept. of Communications and Wave Propagation.
VARIATION OF DERIVED MESOSPHERIC NITRIC OXIDE IN RELATION TO WIND AND TEMPERATURE IN WINTER
M. Friedrich and K. M. Torkar *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 6-15 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 13B

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-20587 Institut d'Aeronomie Spatiale de Belgique, Brussels.
AERONOMICAL ASPECTS OF MESOSPHERIC PHOTODISSOCIATION: PROCESSES RESULTING FROM THE SOLAR H LYMAN ALPHA LINE
Marcel Nicolet 1984 47 p refs Submitted for publication
(Aeronomica-Acta-A-285-1984) Avail: Issuing Activity

The irradiance of the solar H Lyman-alpha line and its variation with solar activity are considered in the determination of the photodissociation of CH4, CO2, H2O and O2, and of the photoionization of NO. Lyman-alpha contributes directly to these processes in the mesosphere after its absorption, which depends on wavelength and temperature, by molecular oxygen. The H Lyman-alpha radiation considered for mesospheric processes is characterized by a profile of an emission line with a central reversal, and wings extending to + or - 1.75 A where the intensity reaches 1% of that of the peak. Formulas for the photodissociation optical depths and frequencies, which take into account solar activity conditions and the spectral characteristics of each molecule are deduced. Author (ESA)

N85-20588 Institut d'Aeronomie Spatiale de Belgique, Brussels.
MIDDLE ATMOSPHERE NO AND NO2 OBSERVED BY MEANS OF THE SPACELAB ONE GRILLE SPECTROMETER
J. Laurent, M.-P. Lemaitre, J. Besson, A. Girard, C. Lippens, C.

Muller, J. Vercheval, and M. Ackerman 1984 22 p refs Presented at Fall Meeting of Amer. Geophys. Union, 3-7 Dec. 1984
(Aeronomica-Acta-A-293-1984) Avail: Issuing Activity

Infrared spectra of the Earth atmospheric limb in absorption were obtained by Spacelab using the setting and rising Sun as a source. On run in the Southern Hemisphere at sunrise was dedicated to the simultaneous observation of NO from 20 to 100 km altitude and of NO2 from 20 to 42 km altitude. The stratospheric profiles agree with previous measurements. The mesospheric NO abundance exhibits a maximum near 90 km altitude and a minimum near 62 km altitude. The NO volume mixing ratio increases at least 1000 times from 60 to 100 km altitude where a value of 0.00001 is reached. Author (ESA)

N85-20589*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A MODELING ANALYSIS PROGRAM FOR THE JPL TABLE MOUNTAIN IO SODIUM CLOUD Interim Report, 1 Dec. 1984 - 28 Feb. 1985
William H. Smyth (Atmospheric and Environmental Research, Inc.) and Bruce A. Goldberg Mar. 1985 15 p refs
(Contract NASw-3949)
(NASA-CR-175493; NAS 1.26:175493) Avail: NTIS HC A02/MF A01 CSCL 04A

The necessary personnel software base was established to accomplish the data processing requirements for this project. Conversion of software required in reformatting the raw Io sodium cloud data was completed and data processing activities were initiated. Slit spectra data acquired by the JPL Table Mountain Io sodium cloud observing program were reviewed and their scientific value assessed. The lifetime description for sodium atoms in the Io sodium cloud model was improved by incorporating the most recently available temperatures and densities for ions and electrons in the plasma torus. E.A.K.

N85-20590# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PRECURSORS FOR BRAZILIAN MAGNETIC ANOMALIES FROM 1922 TO 1969 [PERCURSO DA ANOMALIA MAGNETICA BRASILEIRA ENTRE 1922 E 1969]
D. J. R. SNordemann and N. B. Trivedi Sep. 1984 14 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuniao Anual da SBPC
(INPE-3283-PRE/605) Avail: NTIS HC A02/MF A01

Annual means of the total F, of the horizontal component H and of the declination D of the Earth's magnetic field from four South America observatories (La Quiaca 294.4 deg E; 22.1 deg S, Vassouras 316.3 deg E; 22.4 deg S, Huancayo 284.7 deg E; 12.0 deg S and Pilar 296.1 deg E; 31.7 deg S) from 1922 to 1969 were used to determine the trajectory of the center of the Brazilian magnetic anomaly through a conical model. The evolution observed is discussed in terms of secular variations, westward drift and secondary movements. Author

N85-20591# National Academy of Sciences - National Research Council, Washington, D. C.
NATIONAL SOLAR-TERRESTRIAL RESEARCH PROGRAM, PART 1. SOLAR-TERRESTRIAL RESEARCH FOR THE 1980'S, PART 2 Final Report, 15 Oct. 1983 - 14 Oct. 1984
J. V. Evans 1984 193 p
(Grant AF-AFOSR-0028-84)
(AD-A149542; AFOSR-84-1100TR) Avail: NTIS HC A09/MF A01 CSCL 04/1

Recommendations regarding the funding, start-up and management of the National Solar-Terrestrial research program are given. Studies relevant to the program, data distribution, and methods for coordinating research are among the topics discussed. R.F.J.

N85-20592# State Univ. of New York, Albany.
CRUSTAL STRETCHING AND SUBSIDENCE IN SEDIMENTARY EASTERN SWITZERLAND AND PERMO-CARBONIFEROUS BASINS IN THE CONTINENTAL UNITED STATES Final Report
John F. Dewey 9 Oct. 1984 15 p refs
(Contract DE-AC02-81ER-10933)
(DE85-000622; DOE/ER-10933/T1) Avail: NTIS HC A02/MF A01

Detailed and systematic structural mapping in parts of the Austro-Alpine Nappes allowed reconstruction of the stretching factor, (beta), and its variability across the basin margin from which the subsidence and thermal history of a large rift complex was deduced. From this, a basic picture was derived of the mechanical behavior of the stretched crust-lithosphere during the attenuation process and a knowledge of lithosphere behavior during the prolonged period of Jurassic-Cretaceous cooling. A systematic and very detailed study was also made of the stratigraphic-structural-thermal maturation history of the intracontinental Pennsylvanian-Permian basins and troughs of Colorado, Texas, and Oklahoma. DOE

N85-20593# California Univ., Livermore. Lawrence Livermore Lab.
HIGH-RESOLUTION MICROSEISMICITY STUDY OF POSSIBLE MAGMATIC INTRUSION IN THE LONG VALLEY CALDERA
Albert T. Smith 24 Jan. 1984 16 p refs Presented at the Active Tectonic and Magmatic Process in Long Valley Caldera, California Conf., Napa, Calif., 24-27 Jan. 1984
(Contract W-7405-eng-48)
(DE85-001076; UCRL-90278; CONF-840175-1) Avail: NTIS HC A02/MF A01

Earthquakes which occurred in Long Valley Caldera, California were monitored with seismometers. The resultant high resolution microseismological image of the area suggests the presence of a magmatic intrusion. The orientation and state of stress are consistent with inflation of the magma chamber beneath the Long Valley Caldera. R.S.F.

N85-20594# Zaragoza Univ. (Spain). Seccion Fisicas.
RESOLUTION OF 2-DIMENSIONAL SEISMOLOGIC PROBLEMS BY A FINITE ELEMENT APPROXIMATION. APPLICATION TO THE LOVE WAVE PROPAGATION THROUGH THE ATLANTIC BORDER OF THE IBERIC PENINSULA Ph.D. Thesis [RESOLUCION DE PROBLEMAS SISMOLOGICOS BIDIMENSIONALES MEDIANTE APPROXIMACION POR ELEMENTOS FINITOS. APLICACION A LA PROPAGACION DE ONDAS LOVE A TRAVES DEL MARGEN CONTINENTAL ATLANTICO DE LA PENINSULA IBERICA]
Francisco Jose SeronArbeloa 1 Sep. 1984 247 p refs In SPANISH 2 Vol.
Avail: NTIS HC A11/MF A01

The steady state of a two dimensional irregular zone model excited by a sinusoidal wave at a given frequency is analyzed using a Hamilton variational principle finite element method. An isoparametric formulation with Lagrangian elements was adopted. The excitation is assumed to be caused by Love waves from either side of the irregular zone. A model for the ocean-continent transition zone obtained from experimental data is presented and its behavior as Love wave transmission medium is analyzed. Author (ESA)

N85-20595# Zaragoza Univ. (Spain). Seccion Fisicas.
RESOLUTION OF 2-DIMENSIONAL SEISMOLOGIC PROBLEMS BY A FINITE ELEMENT APPROXIMATION. APPLICATION TO THE LOVE WAVE PROPAGATION THROUGH THE ATLANTIC BORDER OF THE IBERIC PENINSULA. APPENDIX: GRAPHS OF RESULTS Ph.D. Thesis [RESOLUCION DE PROBLEMAS SISMOLOGICOS BIDIMENSIONALES MEDIANTE APROXIMACION POR ELEMENTOS FINITOS. APLICACION A LA PROPAGACION DE ONDAS LOVE A TRAVES DEL MARGEN CONTINENTAL ATLANTICO DE LA PENINSULA IBERICA (APENDICE: OTROS RESULTADOS OBTENIDOS EXPRESADOS DE FORMA GRAFICA]
Francisco Jose SeronArbeloa 1 Sep. 1984 93 p In SPANISH 2 Vol.
Avail: NTIS HC A05/MF A01

The steady state of a two dimensional irregular zone model

excited by a sinusoidal wave at a given frequency is analyzed using a Hamilton variational principle finite element method. An isoparametric formulation with Lagrangian elements was adopted. The excitation is assumed to be caused by Love waves from either side of the irregular zone. A model for the ocean-continent transition zone obtained from experimental data is presented and its behavior as Love wave transmission medium is analyzed.
Author (ESA)

N85-20596# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction de la Physique Generale.
ATMOSPHERIC RESEARCH AIRCRAFT Final Report [AVION DE RECHERCHES ATMOSPHERIQUES]
P. Gondot and A. Delannoy Sep. 1984 113 p refs In FRENCH (Contract DRET-83.123)
(ONERA-RS/87/7154/PY) Avail: NTIS HC A06/MF A01

Probes for evaluating atmospheric electrical conductivity in cloudy conditions and the electric charge of hydrometeors were designed and installed in a C130 aircraft. The measuring principles were validated in laboratory and cloudy wind tunnel tests. Flight tests in cloud free conditions show the suitability of the instruments. In cloudy freezing conditions, measured conductivity is reduced by a factor of two compared with clear sky, revealing weaknesses in values predicted by the wind tunnel tests. Aerodynamic tests are satisfactory. Author (ESA)

N85-20597# National Oceanic and Atmospheric Administration, Rockville, Md. Air Resources Lab.
LIDAR OBSERVATIONS OF STRATOSPHERIC AEROSOL OVER MAUNA LOA OBSERVATORY, 1974 - 1981
J. DeLuisi, T. DeFoor, K. Coulson, F. Fernald, and K. Thorne Aug. 1984 113 p refs
(PB85-115061; NOAA-DR-ERL-ARL-4) Avail: NTIS HC A06/MF A01 CSCL 04A

One hundred seventy-three lidar profiles obtained during the year 1974 to 1981, inclusively are presented. Backscattering ratios are displayed in graphical form for 1-km intervals. Aerosol backscattering cross section, Rayleigh backscattering cross section, backscattering ratio and integrated optical depth are tabulated, also for 1-km intervals. The data reduction computer program is included. GRA

N85-20598# Environmental Sciences Research Lab., Research Triangle Park, N.C.
TURBULENCE PARAMETERS IMPACTING DISPERSION IN AN URBAN CONVECTION BOUNDARY LAYER
J. M. Godowitch and J. K. S. Ching Oct. 1984 16 p refs
(PB85-116036; EPA-600/D-84-255) Avail: NTIS HC A02/MF A01 CSCL 04A

Turbulence measurements of the three dimensional wind components were collected by an instrumented research aircraft. These aircraft flights were conducted as part of the regional air pollution study urban boundary layer field program in St. Louis, Missouri and were designed to determine the magnitude and variation of characteristics of vertical velocity fluctuations in the afternoon convective boundary layer from data obtained at 150 m above ground. The vertical velocity time series for 22.5 km length segments were evaluated to obtain quantitative information on upward and downward turbulent motions in the urban convective boundary layer. Results reveal that vertical velocity distributions for both urban and nonurban segments displayed positive skewness and negative mode. In addition, the results of comparisons of the size of the largest updraft, convective boundary layer height, and the vertical velocity spectral peak wavelength are presented.
Author (GRA)

N85-20599# National Park Service, Atlanta, Ga. Science Publications Office.
PROCEEDINGS OF THE 1ST GLACIER BAY SCIENCE SYMPOSIUM
J. D. Wood, Jr., M. Gladziszewski, I. A. Worley, and G. Vequist Sep. 1984 112 p refs Symp. held at Gustavus, Alaska, 23-26 Sep. 1983 Sponsored in part by Friends of Glacier Bay, Gustavus, Alaska
(PB85-115913) Avail: NTIS HC A06/MF A01 CSCL 08G

A record of the First Glacier Bay Science Symposium, held at Glacier Bay National Park and Preserve, Alaska, on September 22, 1983 is given. Included are abstracts of presentations by four panels: (1) Geology, Glacial Activity, and Climatology; (2) Terrestrial Ecosystems; (3) Marine and Aquatic (freshwater) Ecosystems; and (4) Resource Management. Transcripts of panel discussions are also included. In addition, papers describing the cultural resources and archeology of the Glacier Bay region are also presented.GRA

N85-20600# Cincinnati Univ., Ohio. Lab. of Sedimentology.
LITHOLOGIC AND ENVIRONMENTAL ATLAS OF BEREA SANDSTONE (MISSISSIPPIAN) IN THE APPALACHIAN BASIN Final Report
Paul Edwin Potter, J. Barry Maynard, Dana Jackson, and John DeReamer Jan. 1984 166 p refs Sponsored by Gas Research Inst.
(PB85-129039; GRI-83/0014) Avail: NTIS HC A08/MF A01 CSCL 08G

The Berea Sandstone occurs throughout much of the Appalachian Basin where it is an oil and gas reservoir and is quarried as a building stone. Because of its uniform porosity and permeability in the quarries at South Amherst, Ohio, it has been used by petroleum engineers in North America as a model reservoir sandstone. Currently, the Berea is locally classified as a light gas sand. Six outcrops and 22 cores of the Berea are described. These descriptions are accompanied by wireline logs of the Berea section in the core holes and gamma ray profiles of outcrops to help explorationists, reservoir geologists, and petroleum engineers better interpret the lithology and depositional environments represented by the many thousands of wireline logs in the Applachian Basin. The depositional environments likely to occur in the Berea are briefly described and the various sedimentary structures of the Berea are illustrated so that it can be seen in both outcrops and cores, carefully documents vertical profiles of grain size and sedimentary structures, and concludes with a summary of unresolved problems. GRA

N85-20601# Sydney Univ. (Australia). School of Civil and Mining Engineering.
CONSOLIDATION AROUND A POINT HEAT SOURCE
J. R. Booker and C. Savvidou Feb. 1984 24 p refs
(PB85-116549; R-467) Avail: NTIS HC A02/MF A01 CSCL 08M

When a heat source such as a canister of radioactive waste is buried in a saturated soil the temperature changes that occur can cause the pore water to expand a greater amount than the voids of the soil. The temperature change is thus usually accompanied by an increase in pore pressure. If the soil is sufficiently permeable, these pore pressures dissipate. An analytic solution is developed for the fundamental problem of a point heat source buried deep in a saturated soil. GRA

N85-20602# Environmental Sciences Research Lab., Research Triangle Park, N.C. Meteorology and Assessment Div.
USER'S GUIDE FOR THE PHOTOCHEMICAL BOX MODEL (PBM)
Kenneth L. Schere and Kenneth L. Demerjian Nov. 1984 48 p refs
(PB85-137164; EPA-600/8-84-022A) Avail: NTIS HC A03/MF A01 CSCL 04A

The user's guide for the photochemical box model (PBM) describes the structure and operation of the model and its preprocessors and provides the potential user with guidance in setting up input data. The PBM is a simple stationary single-cell model with a variable height lid designed to provide volume-integrated hour averages of O3 and other photochemical smog pollutants of interest for an urban area for a single day of simulation. The PBM is most appropriate for application in air stagnation conditions with light and variable winds. The PBM assumes that emission sources are homogeneously distributed across the surface face of the box volume and that the volume is well mixed at all

times. The user must provide the PBM with initial species concentrations, hourly inputs of wind speed, source emission fluxes of CO, NC(x), THC, and hydrocarbon reactivity classes, and boundary species concentrations. Values of measured solar radiation and mixed layer depth may be specified at subhourly intervals throughout a simulation. GRA

N85-20603# Brookhaven National Lab., Upton, N. Y. Atmospheric Sciences Div.
EVALUATION OF TWO NUMERICAL INTEGRATOR SCHEMES Final Report
A. A. N. Patrinos and M. J. Leach Dec. 1984 43 p refs (PB85-138196; EPA-600/3-84-112) Avail: NTIS HC A03/MF A01 CSCL 04A

Two numerical integrators of the advection-diffusion equation used in air pollution simulations were tested in the framework of an evaluation methodology. The schemes were an integrator based on a polynomial approximation algorithm and a version of the pseudo-spectral integrator. The evaluation methodology included two test cases: the transport of a spline puff and a constant point source. Testing criteria included accuracy, conservation, and efficiency. Accuracy was assessed with the use of norms which used the exact analytical solution values. The polynomial integrator demonstrated superior consistency in its performance and generally better accuracy. The cost was, however, about 2.5 times that of the pseudospectal one. The pseudospectral integrator with its expanding mesh displayed deteriorating accuracy whenever the signal approached the boundaries. Simple filtering algorithms have failed to effectively control this problem. Author (GRA)

N85-20375*# Naples Univ. (Italy).
TRANSPORT PROCESSES IN THE UPPER ATMOSPHERE
Giovanni M. Carlomagno *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 10 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 04A

N85-20421*# Freie Univ., Berlin (West Germany).
PMP-1: A COORDINATED STUDY OF THE BEHAVIOR OF THE MIDDLE ATMOSPHERE IN WINTER
Karin Labitzke *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 8-12 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20422*# Kyoto Univ. (Japan). Geophysical Inst.
PMP-2: EQUATORIAL WAVE DYNAMICS
Isamu Hirota *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 13-15 refs (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20423*# Centre National de la Recherche Scientifique, Verrieres-Le Buisson (France). Service Aeronomie.
FRENCH ACTIVITIES RELEVANT TO MIDDLE ATMOSPHERE RESEARCH
M. L. Chanin *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 29-33 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20424*# National Physical Lab., New Delhi (India).
MAP IN INDIA
Y. V. Somayajulu *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 39-50 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20425*# Kyoto Univ. (Japan). Ionosphere Research Lab.
MAP IN JAPAN: ORGANIZATION AND PROJECTS
S. Kato *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 51-86 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20426*# University Coll. of Wales, Aberystwyth. Dept. of Physics.
UK PARTICIPATION IN THE MIDDLE ATMOSPHERE PROGRAMME
L. Thomas *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 93-109 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20427*# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
MAP-RELATED ACTIVITIES IN THE UNITED STATES
G. C. Reid *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 110-115 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20428*# Institute of Applied Geophysics, Moscow (USSR). National Committee on Hydrometeorology and Control of the Environment.
SOVIET NATIONAL MIDDLE ATMOSPHERE PROGRAM
A. D. Danilov *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 116-137 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20429*# Bonn Univ. (West Germany). Physikalisches Inst.
THE MIDDLE ATMOSPHERE PROGRAM: WINTER IN NORTHERN EUROPE (MAP/WINE)
U. vonZahn *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 139-146 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20430*# National Inst. of Polar Research, Tokyo (Japan).
THE MIDDLE ATMOSPHERE PROGRAM: A SPECIAL PROJECT FOR THE ANTARCTIC MIDDLE ATMOSPHERE (AMA)
T. Hirasawa *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 147-151 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20433*# Uppsala Ionospheric Observatory (Sweden).
COLD ARCTIC MESOPAUSE PROJECT (CAMP): SCIENTIFIC OBJECTIVES
L. Bjorn *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 161-164 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20440*# National Physical Lab., New Delhi (India).
MAP ACTIVITIES IN HUNGARY
P. Bencze *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 65-73 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20442*# Kyoto Univ. (Japan).
PMP-2 REPORT: EQUATORIAL WAVE DYNAMICS
Isamu Hirota *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 90-93 refs (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20443*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MSG-7: ATMOSPHERIC PENETRATION OF SOLAR RADIATION IN THE RANGE OF SCHUMANN-RUNGE BANDS
J. E. Frederick *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 94 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20444*# National Center for Atmospheric Research, Boulder, Colo.
WORKSHOP ON COMPARISON OF DATA AND DERIVED DYNAMICAL QUANTITIES DURING NORTHERN HEMISPHERE (PMP-1) WINTERS
J. C. Gille and Karin Labitzke (Freie Univ., Berlin, West Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 95-100 Workshop held in Boulder, Colo., 11-14 May 1982 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20447*# Wuppertal Univ. (West Germany).
MAP/GLOBUS CAMPAIGN 1983
D. Offerman *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 17-43 refs (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20449*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MSG-7: MOLECULAR ABSORPTION PROCESSES RELATED TO THE PENETRATION OF ULTRAVIOLET SOLAR RADIATION INTO THE MIDDLE ATMOSPHERE
J. E. Frederick, A. J. Blake (Adelaide Univ.), D. E. Freeman (Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.), R. W. Nicholls (York Univ., Downsview, Ontario), T. Ogawa (Kyoto Univ.), and P. C. Simon (Inst. d'Aeronomie Spatiale de Belgique) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 53-74 refs (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20451*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar-Terrestrial Physics.
NEUTRAL ATMOSPHERE PROPERTIES DETERMINING D-REGION ELECTRON DENSITIES
J. Taubenheim *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 1-5 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20453*# Institute of Applied Geophysics, Moscow (USSR).
MIDDLE ATMOSPHERE TEMPERATURE AND DYNAMICS AS REVEALED FROM D-REGION OBSERVATIONS
A. D. Danilov *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 16-23 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20456*# Academy of Sciences, Kuhlungsborn (East Germany). Central Inst. of Solar Terrestrial Physics.
INDIRECT PHASE HEIGHT MEASUREMENTS IN CENTRAL AND EASTERN EUROPE FOR MONITORING D REGION PLASMA
G. V. Cossart and S. V. Pakhomov (Inst. of Applied Geophysics, Dolgeprudny, USSR) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 34-38 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20458*# Instituto Nacional de Tecnica Aeroespacial, Huelva (Spain).
ABNORMAL CIRCULATION CHANGES IN THE WINTER STRATOSPHERE, DETECTED THROUGH VARIATIONS OF D REGION IONOSPHERIC ABSORPTION
B. A. delaMorena *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 45-51 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20459*# Academy of Sciences (USSR), Troitsk. Inst. of Terrestrial Magnetism.
WINTER ANOMALY OF THE LOWER IONOSPHERE AND ITS POSSIBLE CAUSES
Z. Ts. Rapoport *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 52-57 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20460*# Geophysical Observatory, Sodankyla (Finland).
AUTUMN AND WINTER ANOMALIES IN IONOSPHERIC ABSORPTION AS MEASURED BY RIOMETERS Abstract Only
H. Ranta *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 60-61 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20461*# Ceskoslovenska Akademie Ved, Prague. Geophysical Inst.
WINTER ANOMALY 1982/83 IN COMPARISON WITH EARLIER WINTERS (1960-82)
J. Lastovicka *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 62-65 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20464*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionospheric Research.
SEASONAL CHARACTERISTICS OF MESOSPHERIC PLASMA

AND THEIR TRANSITIONS
E. A. Lauter *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 75-78 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20465*# Freie Univ., Berlin (West Germany). Meteorological Inst.
MIDWINTER DISTURBANCES IN THE MIDDLE ATMOSPHERE
K. Labitzke *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 79-85 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20467*# Academy of Sciences, Kuhlungsborn (East Germany). Central Inst. of Solar Terrestrial Physics.
LARGE SCALE WINTER TIME DISTURBANCES IN METEOR WINDS OVER CENTRAL AND EASTERN EUROPE
K. M. Greisiger, Yu. I. Portnyagin (Inst. of Applied Geophysics, Obninsk, USSR), and I. A. Lysenko (Inst. of Applied Geophysics, Obninsk, USSR) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 91-95 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20468*# Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau (West Germany).
VHF RADAR OBSERVATIONS IN THE STRATOSPHERE AND MESOSPHERE DURING A STRATOSPHERIC WARMING Abstract Only
R. Ruster, P. Czechowsky, G. Schmidt, and K. Labitzke (Freie Univ., Berlin, West Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 96 Submitted for publication (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20470*# Institute of Applied Geophysics, Moscow (USSR).
SOME ASPECTS OF GENERAL CIRCULATION AND TIDES IN THE MIDDLE ATMOSPHERE
A. I. Ivanovskiy *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 101-109 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20471*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionosphere Research.
ASPECTS OF PLANETARY WAVE TRANSPORTS IN THE MIDDLE ATMOSPHERE
G. Schmitz *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 110-115 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20472*# Institut d'Aeronomie Spatiale de Belgique, Brussels.
COUPLING BETWEEN THE THERMOSPHERE AND THE STRATOSPHERE: THE ROLE OF NITRIC OXIDE
G. Brasseur *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 116-121 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20473*# Ondrejov Observatory (Czechoslovakia).
ATMOSPHERIC PROFILE IMPRINT IN FIREWALL ABLATION COEFFICIENT
Z. Ceplecha and P. Pecina *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 122-126 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20475*# Institute of Experimental Meteorology, Obninsk (USSR).
BASIC FEATURES OF GLOBAL CIRCULATION IN THE MESOPAUSE LOWER THERMOSPHERE REGION
Yu. I. Portnyagin *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 134-142 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20476*# Saskatchewan Univ., Saskatoon. Inst. of Space and Atmospheric Studies.
WINDS AND WAVES (4 MIN - 11 YRS) IN THE UPPER MIDDLE ATMOSPHERE (60-110 km) AT SASKATOON, CANADA (52 DEG N, 107 DEG W): MF RADAR (2.2 MHz) SOUNDINGS 1973 - 1983
A. H. Manson, C. E. Meek, and J. B. Gregory *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 143-151 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20477*# Academy of Sciences (USSR), Irkutsk. Inst. of Terrestrial Magnetism.
THE DYNAMICS OF IONOSPHERIC D REGION OVER EAST SIBERIA
E. S. Kazimirovsky *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 152-159 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20478*# Leipzig Univ. (East Germany). Dept. of Physics.
MEASUREMENT OF THE VERTICAL GRADIENT OF THE SEMI-DIURNAL TIDAL WIND PHASE IN WINTER AT THE 95 km LEVEL
R. Schminder and D. Kurschner *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 160-164 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20479*# Academy of Sciences (USSR), Irkutsk. Inst. of Terrestrial Magnetism.
STRATWARM EFFECTS IN THE IONOSPHERIC D REGION WIND FIELD
G. V. Vergasova *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 166-170 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20480*# Academy of Sciences (USSR), Moscow. Inst. of Physics of the Atmosphere.
OROGRAPHIC DISTURBANCES OF UPPER ATMOSPHERE EMISSIONS
N. N. Shefov and N. N. Pertsev *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 171-175 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20481*# University of Western Ontario, London. Dept. of Physics.
TWILIGHT INTENSITY VARIATION OF THE INFRARED HYDROXYL AIRGLOW
R. P. Lowe, K. L. Gilbert, and R. J. Niciejewski *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 176-178 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20482*# Hungarian Academy of Sciences, Sopron. Geodetic and Geophysical Research Inst.
INVESTIGATION OF AERONOMIC PROCESSES ON THE BASIS OF IONOSPHERIC SPORADIC E
P. Bencze *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 179-182 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20483*# Academy of Sciences (USSR), Ashkhabad. Physico-Technical Inst.
SPACE AND TIME VARIATIONS AND TURBOPAUSE DYNAMICAL STRUCTURE
O. G. Ovezgeldiyev, L. P. Korsunova, and Yu. Karadzhayev *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 183-187 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20484*# Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
THE HIGH LATITUDE D REGION DURING ELECTRON PRECIPITATION EVENTS
J. K. Hargreaves, P. N. Collis, and A. Korth (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 188-191 refs Submitted for publication (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20485*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar Terrestrial Physics.
HIGH ENERGY PARTICLE EFFECTS IN THE D REGION DURING AND AFTER GEOMAGNETIC STORMS Abstract Only
E. A. Lauter and C.-U. Wagner *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 192 (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20487*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionosphere Research.
DEPENDENCE OF THE HIGH LATITUDE MIDDLE ATMOSPHERE IONIZATION ON STRUCTURES IN INTERPLANETARY SPACE
J. Bremer and E. A. Lauter *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 200-204 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20488*# Hungarian Academy of Sciences, Sopron. Geodetical and Geophysical Research Inst.
SOLAR TERRESTRIAL INFLUENCES ON THE D REGION AS SHOWN BY THE LEVEL OF ATMOSPHERIC RADIO NOISE
G. Satori and B. Schaning (Academy of Sciences, Kuhlungsborn, East Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 205-210 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20489*# Academy of Sciences, Berlin (East Germany). Central Inst. of Solar Terrestrial Physics.
LATITUDINAL DEPENDENCE OF THE ENERGY INPUT INTO THE MESOSPHERE BY HIGH ENERGY ELECTRONS
C. U. Wagner, B. Nikutowski, and H. Ranta (Geophysical Observatory, Sodankyla, Finland) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 211-212 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20490*# Academy of Sciences, Neustrelitz (East Germany). Inst. of Space Research.
OZONE MEASUREMENTS IN THE MESOSPHERE DURING A SOLAR PROTON EVENT
W. Lippert and D. Felske *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 213-215 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04A

N85-20491*# Academy of Sciences, Neustrelitz (East Germany). Inst. of Space Research.
GEOMAGNETIC DISTURBANCES CAUSED BY INTERNAL ATMOSPHERIC DYNAMICS
G. Sonneman *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 216-220 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 08G

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-20604*# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
A STUDY OF EDDY-MEAN FLOW INTERACTIONS USING ELIASSEN-PALM DIAGNOSTICS: FGGE SOP-1 DATA AND THE NASA GLAS GENERAL CIRCULATION MODEL COMPARED Final Report
Mark P. Baldwin, H. J. Edmon, Jr., and James R. Holton 1984 71 p refs
(Grant NAG5-233)
(NASA-CR-175508; NAS 1.26:175508) Avail: NTIS HC A04/MF A01 CSCL 04B

Latitude-height cross sections of the Eliassen-Palm (ep) flux, its divergence, the residual mean meridional circulation as well as conventional eddy and mean flow fields are computed using both observational and general circulation model data. B.G.

N85-20605*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THREE-DIMENSIONAL BAROCLINIC INSTABILITY OF A HADLEY CELL FOR SMALL RICHARDSON NUMBER
Basil N. Antar and William W. Fowlis Mar. 1985 33 p refs
(NASA-TP-2450; NAS 1.60:2450) Avail: NTIS HC A03/MF A01 CSCL 04B

A three-dimensional, linear stability analysis of a baroclinic flow for Richardson number, Ri, of order unity is presented. The model considered is a thin horizontal, rotating fluid layer which is subjected to horizontal and vertical temperature gradients. The basic state is a Hadley cell which is a solution of the complete set of governing, nonlinear equations and contains both Ekman and thermal boundary layers adjacent to the rigid boundaries; it is given in a closed form. The stability analysis is also based on the complete set of equations; and perturbation possessing zonal, meridional, and vertical structures were considered. Numerical methods were developed for the stability problem which results in a stiff, eighth-order, ordinary differential eigenvalue problem. The previous work on three-dimensional baroclinic instability for small Ri was extended to a more realistic model involving the Prandtl number, sigma, and the Ekman number, E, and to finite growth rates and a wider range of the zonal wavenumber. Author

N85-20606# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Sciences.
LAKE ICE OCCURRENCE AS A POSSIBLE DETECTOR OF ATMOSPHERIC CO2 EFFECTS ON CLIMATE Progress Report, 1 Dec. 1983 - 30 Nov. 1984
R. G. Barry Nov. 1984 5 p refs
(Contract DE-AC02-83ER-60106)
(DE85-002951; DOE/ER-60106/1) Avail: NTIS HC A02/MF A01

Temporal patterns of the freeze-up and break-up of lakes in middle and high latitudes were analyzed to determine the usefulness of such data as an integrative index of thermal trends that are expected as a result of CO2 induced climatic effects. High correlations exist between daily mean air temperatures during approximately 80 days prior to these events and the freeze-up/break-up dates, confirming the value of lake ice data as an index of thermal regime during the transition seasons. A change in freeze-up date of plus or minus 6 (plus or minus 4) days corresponds to a plus or minus 1(0)C temperature change. Break-up dates show lower correlations although decadal averages show greater coherence than for freeze-up. A spatial array of lake-ice conditions monitored by satellite could serve as a useful tool for early detection of possible CO2-induced perturbations. DOE

N85-20607# Tennessee Valley Authority, Chattanooga. Div. of Energy Conservation and Rates.
WIND: MEASURING FOR ENERGY
1984 7 p
(DE85-900227; TVA/OP/ECR-82/64) Avail: NTIS HC A02/MF A01

TVA has a program in which anemometers are loaned to qualified people for the assessment of wind data at potential wind turbine sites. The anemometers are available for periods up to six months to those who purchase electricity from a distributor of TVA power, have a site that is 1500 feet above mean sea level, and meet certain minimum land requirements. An application is provided. DOE

N85-20608# Pacific Northwest Lab., Richland, Wash.
WEATHER DATA FOR SIMPLIFIED ENERGY CALCULATION METHODS. VOLUME 2: MIDDLE UNITED STATES. TRY DATA
A. R. Olsen, S. Moreno (Deringer Group, Washington, D.C.), J. Deringer (Deringer Group, Washington, D.C.), and C. R. Watson Aug. 1984 255 p refs
(Contract DE-AC06-76RL-01830)
(DE85-000494; PNL-5142-Vol-2) Avail: NTIS HC A12/MF A01

A source of weather data for direct use with a number of simplified energy calculation methods is provided. Complete weather data for a number of cities in the United States are provided for use in the following methods: degree hour, modified degree hour, bin, modified bin, and variable degree day. Sets of weather data for 22 cities in the continental United States using Test Reference Year (TRY) source weather data are given. The weather data at each city are summarized in a number of ways to provide differing levels of detail necessary for alternative simplified energy calculation methods. Weather variables summarized include dry bulb and wet bulb temperature, percent relative humidity, humidity ratio, wind speed, percent possible sunshine, percent diffuse solar radiation, total solar radiation on horizontal and vertical surfaces, and solar heat gain through standard DSA glass. Monthly and annual summaries, in some cases by time of day, are available. These summaries are produced in a series of nine computer generated tables. DOE

N85-20609# World Meteorological Organization, Geneva (Switzerland).
INTERNATIONAL LIST OF SELECTED, SUPPLEMENTARY AND AUXILIARY SHIPS
1984 389 p In ENGLISH and FRENCH
(WMO-47-ed-84) Avail: NTIS MF A01; print copy available at WMO, Geneva SWFR 37

The names, country of origin, instruments, operating conditions, number of radio operators, and call signs of ships in the World Meteorological Organization Observing Ship Scheme are listed. The method of obtaining sea surface temperature is indicated. Author (ESA)

N85-20610# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR OCTOBER 1984, VOLUME 38, NUMBER 19, 29 SEPTEMBER 1984
29 Sep. 1984 10 p refs
(PB85-113538) Avail: NTIS HC A02/MF A01 CSCL 04B

The report contains maps which show observed and probability estimates of temperature and precipitation for October 1984 in the United States and Canada. GRA

N85-20611# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR MID-OCTOBER TO MID-NOVEMBER 1984, VOLUME 38, NUMBER 20, 13 OCTOBER 1984
13 Oct. 1984 10 p refs
(PB85-113546) Avail: NTIS HC A02/MF A01 CSCL 04B

The report contains maps which give observed and probability estimates of temperature and precipitation for October and November 1984 in the United States and Canada. GRA

N85-20612# National Weather Service, Salt Lake City, Utah.
THE 500 MILLIBAR SIGN FREQUENCY TELECONNECTION CHARTS: FALL
L. B. Dunn May 1984 165 p refs
(PB85-110930; NOAA-TM-NWS-WR-187) Avail: NTIS HC A08/MF A01 CSCL 04B

The question of spacial relationships (teleconnectivity) between anomalies in the upper-air flow patterns is an old one, but one that recently has received a great deal of attention. Forecasters are frequently confronted with determining the probability of a trough developing or it remaining over a given latitude and longitude given the presence of a trough or ridge at some other latitude and longitude. One way to make use of the correlation patterns in operational forecasting is through the use of sign-frequency teleconnection charts. A sign frequency chart gives the probability of above or below normal heights around the Northern Hemisphere given a height anomaly at a particular latitude/longitude. Sign

frequency charts for 500 mb 5 day means collected in the fall are presented. Author (GRA)

N85-20613# National Weather Service, Salt Lake City, Utah.
THE 500 MILLIBAR SIGN FREQUENCY TELECONNECTION CHARTS: SUMMER
L. B. Dunn Mar. 1984 165 p refs
(PB85-111359; NOAA-TM-NWS-WR-185) Avail: NTIS HC A08/MF A01 CSCL 04B

The question of spacial relationships (teleconnectivity) between anomalies in the upper-air flow patterns is an old one, but one that recently has received a great deal of attention. Forecasters are frequently confronted with determining the probability of a trough developing or it remaining over a given latitude and longitude given the presence of a trough or ridge at some other latitude and longitude. One way to make use of the correlation patterns in operational forecasting is through the use of sign-frequency teleconnection charts. A sign frequency chart gives the probability of above or below normal heights around the Northern Hemisphere given a height anomaly at a particular latitude/longitude. Sign frequency charts for 500 mb 5 day means collected in the summer are presented. Author (GRA)

N85-20614# National Weather Service, Salt Lake City, Utah.
THE 500 MILLIBAR SIGN FREQUENCY TELECONNECTION CHARTS: SPRING
L. B. Dunn Jan. 1984 162 p refs
(PB85-111367; NOAA-TM-NWS-WR-183) Avail: NTIS HC A08/MF A01 CSCL 04B

The question of spacial relationships (teleconnectivity) between anomalies in the upper-air flow patterns is an old one, but one that recently has received a great deal of attention. Forecasters are frequently confronted with determining the probability of a trough developing or it remaining over a given latitude and longitude given the presence of a trough or ridge at some other latitude and longitude. One way to make use of the correlation patterns in operational forecasting is through the use of sign-frequency teleconnection charts. A sign frequency chart gives the probability of above or below normal heights around the Northern Hemisphere given a height anomaly at a particular latitude/longitude. The charts contained herein are sign-frequency charts for 500-mb 5-day means that were collected in the spring of the year. Author (GRA)

N85-20615# National Center for Atmospheric Research, Boulder, Colo.
INSTRUCTOR'S HANDBOOK ON METEOROLOGICAL INSTRUMENTATION
F. V. Brock and C. E. Nicolaidis Jun. 1984 342 p refs Sponsored in part by NSF
(PB85-105930; NCAR/TN-237/1A) Avail: NTIS HC A15/MF A01 CSCL 04B

Useful material to assist instructors in teaching meteorological instrumentation is provided in this handbook. It is intended to provide flexibility in meeting the needs of individual teaching programs. The Handbook, therefore, provides a variety of teaching materials: text, references, questions, problems, and laboratory exercises. Its purpose is to fill the existing gap in meteorological teaching texts, until better textbooks become available. Author (GRA)

N85-20616# National Weather Service, Salt Lake City, Utah.
PLOTFILE APPENDER
W. L. Wolf Jul. 1984 16 p refs
(PB85-109502; NOAA-NWS-WRCP-45) Avail: NTIS HC A02/MF A01 CSCL 09B

A computer program PA.SV which was designed to allow the user to take two AFOS plotfiles and combine them in a newly created plotfile to be stored in the AFOS data base is described. Author (GRA)

N85-20617# National Weather Service, Salt Lake City, Utah.
ISENTROPIC OBJECTIVE ANALYSIS
J. L. Anderson Aug. 1984 24 p refs
(PB85-112167; NOAA-NWS-WRCP-47) Avail: NTIS HC A02/MF A01 CSCL 09B

A computer program was written to produce analyses of pressure, condensation, pressure, and observed wind streamlines on isentropic surfaces. Condensation pressure is the pressure to which a parcel on the isentropic surface would have to be fitted to achieve saturation. GRA

N85-20618# National Weather Service, Salt Lake City, Utah. Scientific Services Division.
USE AND INTERPRETATION OF ISENTROPIC ANALYSES
Jeffrey L. Anderson Oct. 1984 48 p refs
(PB85-132694; NOAA-TM-NWS-WR-188) Avail: NTIS HC A03/MF A01 CSCL 04B

The vast majority of analyses of the atmosphere that are currently available to the field forecaster on AFOS are produced on constant pressure, isobaric surfaces. These charts are supplemented by analyses of surface data. Data analyses produced on isentropic charts can provide a different view of the current state of the atmosphere and can enhance the forecaster's understanding of local weather conditions. Isentropic analyses of three parameters, pressure, condensation pressure, and streamlines are now available on AFOS using an applications program. These charts provide information about the atmosphere including temperature, heights, the location of fronts and baroclinic zones, the trajectories of atmospheric parcels, the location of moist and dry tongues, the proximity of air masses to saturation, the direction of flow, and the vertical motion of atmospheric parcels. GRA

N85-20439*# Bonn Univ. (West Germany).
WINTER IN NORTHERN EUROPE (WINE) PROJECT
U. vonZahn *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 42-53 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

N85-20441*# Freie Univ., Berlin (West Germany).
PMP-1 REPORT: THE FOURTH WINTER OF PMP-1, 1981 - 1982: A WINTER WITH SEVERAL INTERESTING FEATURES
Karin Labitzke *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 79-89 refs (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

N85-20446*# Freie Univ., Berlin (West Germany).
THE FIRST WINTER OF MAP-DYNAMICS, 1982-1983: A WINTER WITH THREE DIFFERENT WARMING PERIODS
Barbara Naujokat, Karin Petzoldt, Karin Labitzke, and Renate Lenschow *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 1-15 refs (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

N85-20462*# Bulgarian Academy of Science, Sofia. Geophysical Inst.
A MODEL OF THE INFLUENCE OF NEUTRAL AIR DYNAMICS ON THE SEASONAL VARIATION IN THE LOW IONOSPHERE
G. Nestorov, P. J. Velinov, and T. Pancheva *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 66-69 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

N85-20466*# Academy of Sciences, Kuhlungsborn (East Germany). Central Inst. of Solar Terrestrial Physics.
SPRING CHANGEOVER OF THE MIDDLE ATMOSPHERE CIRCULATION COMPARED WITH ROCKET WIND DATA UP TO 80 km
G. Entzian, D. A. Tarasenko (Inst. of Applied Geophysics, Dolgoprudny, USSR), and E. A. Lauter *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 86-90 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

N85-20469*# Academy of Sciences, Kuhlungsborn (East Germany). Observatory of Ionosphere Research.
CHANGES IN THE OZONE CONTENT OVER CENTRAL EUROPE DURING REVERSALS OF STRATOSPHERIC CIRCULATION IN LATE WINTER
G. Entzian and K. H. Grasnick (Meteorological Service, Potsdam, East Germany) *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 97-100 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

N85-20474*# Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
METEOR WIND RESULTS FROM ATLANTA, USA, AND RAMEY, PUERTO RICO
R. G. Roper *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 127-133 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

N85-20768# National Oceanic and Atmospheric Administration, Washington, D. C.
CIVIL WEATHER SATELLTE SYSTEMS
Donald B. Miller *In* AGARD Space System Applications to Tactical Operations Oct. 1984 10 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-20619# Coast Guard Research and Development Center, Groton, Conn.
ATLAS OF THE BEAUFORT SEA Final Report
I. M. Lissauer, L. E. Hachmeister, and B. J. Morson Oct. 1984 182 p
(AD-A149545; CGR/DC-17/84; USCG-D-33-84) Avail: NTIS HC A09/MF A01 CSCL 08/3

This is a reference document on oceanography, meteorology, ice and climatology. The oceanography section contains information for circulation, tides, riverine input, ice conditions, storm surges and bathymetry of the Alaskan Beaufort Sea. From review of information on meteorology, climate, ice conditions, and oceanography, maps have been generated showing circulation in two typical wind conditions: ENE wind at 10 knots and NW storm wind at 30 knots. These maps show tides, storm surges, bathymetry and river discharges as well as charts of mean ice drift over time. The meteorology section contains information on winds, storm surges and waves. Included is a rapid manual forecast system for estimating the height of a storm surge. The ice section gives information on the ice zones, including the annual ice cycle within the nearshore area, the freezing and breakup of nearshore ice, and the movement of the pack ice. The climatology section includes information on the arctic climate, temperature information (including wind chill charts), visibility, and precipitation. GRA

N85-20620# Oregon State Univ., Corvallis. Dept. of Oceanography.
MESOSCALE STUDIES OF FLOW REGIMES AND FLUXES OF PARTICULATE MATTER IN COASTAL WATERS Final Report, 1 Apr. 1977 - 31 Jan. 1983
David M. Nelson, Hasong Pak, Lawrence F. Small, and J. Ronald V. Zaneveld Dec. 1984 18 p refs
(Contract DE-AT06-77EV-70029)
(DE85-003825; DOE/EV-70029/T1) Avail: NTIS HC A02/MF A01

Research results in the following areas are summarized: (1) the historical (10 year) patterns of phytoplankton biomass and productivity off central Oregon have been described; (2) an in situ instrument package was developed; (3) a new method of measuring the relative abundance of biogenic particles and terrigenous particles was tested; (4) the winter distributions and movements of suspended particulate matter in a near-coast region of smooth bathymetry were observed; (5) the summer distribution and movements of suspended particulate matter in the region of a submarine canyon were observed; (6) the biological and chemical nature of the suspended particulate matter was characterized; (7) the processes forming and maintaining the prominent subsurface oxygen maximum were elucidated; (8) an attenuation meter capable of being moored for several months was developed and deployed; and (9) a monthly sampling program to determine the seasonal cycle of suspended particulate matter distribution and composition was conducted. DOE

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-20621# School of Aerospace Medicine, Brooks AFB, Tex.
BEHAVIOR DEGRADATION DUE TO 1100-RAD PULSED RADIATION EXPOSURE (5.8:1 NEUTRON/GAMMA RATIO) Final Report, Jun. - Dec. 1982
G. C. Brown, M. G. Yochmowitz, G. B. Hubbard, K. A. Hardy, D. M. Hughes, and Billy Yarbrough Oct. 1984 60 p
(AF Proj. 7757)
(AD-A149284; USAFSAM-TR-84-30) Avail: NTIS HC A04/MF A01 CSCL 06/18

A self-paced, 3-light, 3-lever discrete avoidance behavioral task was used for further study of behavioral performance effects of a high-neutron, low-gamma radiation pulse exposure (average 1100 rads midline tissue, 5,8:1 neutron/gamma ratio). Eight rhesus monkeys were exposed at the White Sands Missile Range Fast Burst Reactor and tested daily for up to 5 days after exposure. On the exposure day, all eight subjects had significantly degraded response accuracy, seven had increased reaction-time scores, seven experienced productive emesis. One day after exposure, most subjects performed near baseline levels except for occasional brief period(s). At 2 days, two subjects were unable to meaningfully perform the behavioral task and were euthanatized. The other six subjects were more variable than on the previous day. Three subjects experienced additional emetic episodes. At 5 days, only two of the remaining four animals performed at any reasonable degree. It is unlikely that any animal could have performed on the sixth day. GRA

N85-20622# Smithsonian Institution, Rockville, Md. Environmental Research Center.
PRIMARY LIGHT HARVESTING SYSTEM: THE RELATIONSHIP OF PHYCOBILISOMES TO PHOTOSYSTEM 1 AND 2 Progress Report, Sep. 1983 - Mar. 1984
E. Gantt 1984 5 p
(Contract DE-AS05-76ER-04310)
(DE85-003075; DOE/ER-04310/T2) Avail: NTIS HC A02/MF A01

Phycobilisomes with photosystem (PS) 2 activity as measured by oxygen evolution, and reduction of dichlorophenol indophenol were isolated in special medium, the phycobilisomes remain intact, and the PS 2 activity is preserved. These preparations are deficient in the PS 1 reaction center pigment P700, and in the PS 1 polypeptide CO 1. Preparations of this system are further characterized to determine the P680 content, to ascertain the DCMU-binding protein, cytochromes, and other polypeptides which are specific for PS 2, and also for PS 1. In addition, the sidedness of thylakoid membranes of red algae and cyanobacteria are also explored by immunocytochemistry (EM) and fractionation on acrylamide gels. Attachment of the phycobilisomes, and the location of the terminal emitter of physobilisomes, are an integral part of these studies. Results will aid in an understanding of the energy transfer in the photosynthetic apparatus of these groups of organisms which appear to have a considerable convergence from green plants. DOE

N85-20623# Georgia Univ., Athens. Research Foundation.
NITROGEN CONTROL OF PHOTOSYNTHETIC PROTEIN SYNTHESIS Progress Report
G. W. Schmidt Nov. 1984 5 p
(Contract DE-FG09-84ER-13188)
(DE85-003513; DOE/ER-13188/1) Avail: NTIS HC A02/MF A01

The molecular relationship between nitrogen nutrition and the synthesis of photosynthetic proteins in Chlamydomonas reinhardtii was studied. Most of the effort has concerned development of analytical techniques and reagents to be used in studies of the effects of nitrogen deficiency on chloroplast biogenesis and the responses of such cells to nitrogen provision. These techniques are summarized. DOE

N85-20624# Hawaii Univ., Honolulu.
RESEARCH AND DEVELOPMENT OF SHALLOW ALGAL MASS CULTURE SYSTEMS FOR THE PRODUCTION OF OILS
Edward A. Laws Oct. 1984 59 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-83CH-10093)
(DE85-000518; SERI/STR-231-2496) Avail: NTIS HC A04/MF A01

The major accomplishment of the past nine months' work was the identification of a microalgal species which can be grown in the system on a 12-month basis without temperature control. The most promising species identified to date is a strain of platymonas sp. This strain grows rapidly at temperatures from 20(0) to to 34(0)C, and at salinities from 1.5 to 3.5%. Neither the lower temperature limit nor the lower salinity limit of the strain are known at this time. A factorial experiment designed to determine optimum growth conditions indicated that the optimum culture depth was 10 cm, the optimum pH about 7.5, and the optimum flow rate about 30 cm/s. A major discovery was that diluting the culture every third day greatly enhanced production. In this dilution mode daily yields averaged 46 g/m(2) ash-free dry weight (AFDW) over a one-month period, and photosynthetic efficiencies averaged 11% (based on visible light energy). The former figure is over twice the best long-term yields achieved in microalgal mass culture systems grown exclusively on inorganic nutrients. DOE

N85-20625# Yale Univ., New Haven, Conn. School of Medicine.
SIMULTANEOUS DETERMINATION OF CEREBRAL BLOOD FLOW AND PARTITION COEFFICIENT WITH A FREELY DIFFUSABLE TRACER
Aldo Rescigno, Richard M. Lambrecht, Charles C. Duncan, C. Y. Shiue, and Laura R. Ment 1984 9 p refs Presented at the NATO Advanced Study Inst. on Phys. and Eng. of Med. Imaging, Maratea (Italy), 24 Sep. 1984 Prepared in cooperation with Brookhaven National Laboratory, Upton, N.Y.
(Contract DE-AC02-76OR-00016; Grant NIH R01-NS-16802)
(DE85-001226; BNL-35349; CONF-8409164-1) Avail: NTIS HC A02/MF A01

A method is described, whereby cerebral blood flow (CBF) and partition coefficient are determined using the tracer (18)F-4-1 fluoroantipyrine and positron emission tomography. DOE

N85-20626# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
MICROALGAE CULTURE COLLECTION, 1984-1985
Sep. 1984 62 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013035; SERI/SP-231-2486) Avail: NTIS HC A04/MF A01

Twelve microalgae species important in fuel production and available from the Solar Energy Research Institute are enumerated. A major emphasis of the culture collection is to make available most of the existing scientific and culture data for each strain in the collection. Each strain is listed with a summary of its most important physiological and culture characteristics. DOE

N85-20627# Oak Ridge National Lab., Tenn. Chemical Technology Div.
PHOTOSYNTHETIC WATER SPLITTING
E. Greenbaum 1984 3 p Presented at the Gas Research Inst. Contractor's Rev. Meeting on Gaseous Fuel Syn. from Inorg. Resources, Schaumberg, Ill., 17-18 Oct. 1984 Sponsored in part by Gas Research Inst.
(Contract DE-AC05-84OR-21400)
(DE85-002460; CONF-8410184-1) Avail: NTIS HC A02/MF A01

Algae photosynthesis is a key area of research for the production of gaseous fuels from inorganic resources. Absolute energy and quantum conversion efficiencies were measured for five green algae species. Wild Chlamydomonas reinhardtii strains were subject to anaerobiosis, CO2 deprivation, and irradiation in order to increase H2 and/or O2 photoproduction yields. DOE

N85-20628# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
25 Feb. 1985 95 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-010) Avail: NTIS HC A05/MF A01

Progress in life, biomedical, and behavioral sciences is reported. Categories discussed include: agrotechnology, biochemistry, biophysics, biotechnology, ecology, environment, epidemiology, genetics, human factors, immunology, laser application, marine mammals, medicine, microbiology, nonionizing electromagnetic radiation effects, pharmacology and toxicology, physiology, public health, psychology, radiation biology, veterinary medicine, and virology. For individual titles, see N85-20629 through N85-20637.

N85-20629# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL SYSTEM THEORY IN PRACTICE Abstract Only **c52**
A. S. Sosnovskiy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 49-50 Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 15, no. 4, Oct. - Dec. 1984 p 119-124 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

The isomorphism of functional system theory (FST) which resulted in the development of physiological cybernetics as a new branch of science is outlined. The FST has made it possible to analyze the integrated activity of individual neurons; exhibits on chemical and physical factors, as they affect neuronal function, were used to demonstrate the role of postsynaptic processes in the integration of signals converging on a single neutron. Laser studies demonstrated the relationship between neurotransmitter-mediated postsynaptic excitation and intracellular neurochemical processes. The systemic mechanisms of stability in the face of emotional stress, which are based on the biological theory of emotions is outlined. It includes information on the modeling of emotional stress in animals, which approximates socially induced stress in man. The essential model in these studies consists of conflict situations, which induce stress in man. The essential model in these studies consists of conflict situations, which induce

psychosomatic pathology. Systemic quantification of behavior is illustrated by studies on expert marksmen. The devices shown are microelectronic radiotelemetry instruments, a device for measuring low-amplitude discharges from nerves, equipment for measuring angular acceleration in the joints of children, Adaptron OFS-1 instrument for studying intuitive learning in man, a pace setter for breathing exercises, electric tactile stimulator for diagnosis of musculo-skeletal disorders, a Kovyl apparatus for radio and telephone transmission of EKG patterns to diagnostic centers, and a systems approach to evaluation of biotechnical electrocardio stimulators, and a computerized system for respiratory functional analysis. E.A.K.

N85-20630# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF HUMAN MASSETER UNDER CONDITIONS OF HYPOKINESIA Abstract Only **c52**
V. A. Solovyev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 50 Transl. into ENGLISH from Ark. Anat. Gistol. i Embriol. (Leningrad), no. 9, Sep. 1984 p 77-83 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

Human masseters were analyzed by quantitative methods. The bioptates of the masseter of males with normal bite were studied and after immobilization of jaw fractures. In 3 days after immobilization, intervals between some muscle bundles and fibers increased somewhat, indicating edema of the tissues while cisterns of the sacoplasmic network expanded. The level of pinocytic vesicles in endothelial blood vessel capillaries increased. In 12 days after immobilization in addition to unchanged fibers, fibers containing sections of decomposition and cytolysis appeared. In 24 days after immobilization, the mean area of cross section of muscle fibers was reduced to decrease of the percent of large myons, succinate dehydrogenase activity was much lower than that of the control figure, the percent of myons with low optical density increased while the percent with high succinate dehydrogenase activity decreased. Study of the dynamics of central moments of statistical distribution of succinate dehydrogenase activity after immobilization revealed the obvious enthalpic nature of changes of succinate dehydrogenase activity of the muscle tissue. The level of pinocytic vesicles in endotheliocytes of the capillaries changed and differed from control levels at all stages of the study. E.A.K.

N85-20631# Joint Publications Research Service, Arlington, Va.
EFFECTS OF HYPERTHERMIA ON FREE AMINO ACIDS IN RAT BRAIN AND IN SUBCELLULAR FRACTIONS Abstract Only
I. M. Turyanitsa, A. Ye. Pashchenko, M. V. Dorogiy, and T. M. Fedorovich *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 51 Transl. into ENGLISH from Ukr. Biokhim. Zh. (Kiev), v. 56, no. 6, Nov. - Dec. 1984 p 663-666 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

Effects of hyperthermia on free amino acid levels in the brain were studied in outbred rats to complement available data on the effects of hypothermia. Analysis of the grey matter revealed marked depression of most amino acids in the first 7 min of hyperthermia, with the exception of glutamic acid which rose to 104.5 mg% from a backround value of 33.3 mg%. Thereafter, the levels of the various amino acids rose and in some cases exceeded control values. Analysis of mitochondria showed elevation of most acids during the initial 7 min, and thereafter depression to, or below, the control values by 20 min; a secondary rise was evident by 60 min. Analysis of the nuclear fraction of free amino acids revealed an opposite pattern to that observed with the mitochondria. It is indicated that hyperthermia has a profound metabolic effect on the brain, and results in redistribution of the free amino acid pool among the subcellular fractions. E.A.K.

N85-20632# Joint Publications Research Service, Arlington, Va.
PSYCHOLOGICAL ASPECTS OF PHENOMENON OF SPATIAL SYNCHRONIZATION OF EEG POTENTIAL Abstract Only **c52**
M. N. Livanov and N. Ye. Sviderskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 51-52 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 5, Sep. - Oct. 1984 p 71-83 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

The electrophysiological components in mental processes were studied. One approach uses maximum registration of electric wave processes in comparison with certain normal and pathological states, while another uses data of spatial and temporal bioelectric processes to support theories about isolabile nerve center factors and the synchronism of bioelectric activity in organizing brain functions. The forms, degrees and limits of such correlations were examined. The EEG's were recorded to determine the general level of synchronization, cross-correlational fields in individual sections of the cortex, and a coefficient of asymmetry in brain function. It is indicated that the focus of maximum synchronization and specific types of personal behavior were functionally related. Feelings of self-worth had a positive correlation to EEG synchronization, and inter and intrahemispheral correlations were related to individual behavioral characteristics. Both basal and specific activity EEG patterns showed that spatial synchronization of biopotential can serve as an index of general activational shifts. The degree of intensity of nonspecific general synchronization reflected the difficulty of intellectual tasks being performed, and a multichannel EEG was the most effective device for measuring this potential. E.A.K.

N85-20633# Joint Publications Research Service, Arlington, Va.
TOPOGRAPHY OF HUMAN BRAIN ELECTRIC POTENTIALS AND DOMINANCE Abstract Only **c52**
V. A. Doroshenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 52 Transl. into ENGLISH from Fiz. Zh. (Leningrad), no. 10, Oct. 1984 p 1361-1365 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

A method to show differences in topography of slow negative wave components recorded in associative regions of the cortex during uniform structure of activity of subjects performing different tasks is presented. Subjects performed two sensorimotor tasks which involved reaction time and stimulus recognition with registration of the contingent negative variation. Differences in amplitude of early and late slow negative waves in lobal-central obductions are shown during task performance. Factoral analysis reveals latent mechanisms of development and changes of early and late negative waves during task performance. E.A.K.

N85-20634# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL SIGNIFICANCE OF SOME EEG PARAMETERS AND DOMINANT PRINCIPAL Abstract Only **c52**
I. Ye. Kanunikov and A. R. Sharipov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 53 Transl. into ENGLISH from Fiz. Zh. (Leningrad), no. 10, 1984 p 1366-1373 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

Contingent negative variation concerning dominance was analyzed. Subjects performed four different tasks involving intention, expectation, prediction and observation. The EEG readings were taken from the frontal, temporal and central sections of the brain. It is shown that contingent negative variation has a complete, uneven temporal-spatial organization and can be adequately described by four relatively independent components, differing in topography, time of development and sensitivity to variation of experimental variables which are monitored. Problems concerning physiological mechanism for and functional significance of these factors for dominance is discussed. E.A.K.

N85-20635# Joint Publications Research Service, Arlington, Va.
EFFECTS OF TASKS ON RESPONSES OF HUMAN SKIN MECHANORECEPTORS Abstract Only **c52**
K. Soininen, T. Yarvilekhto, Yu. I. Aleksandrov, and V. B. Shvyrkov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 53 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 5, Sep. - Oct. 1984 p 104-110 (For primary document see N85-20628 11-51)

Avail: NTIS HC A05/MF A01

Activity in the efferent peripheral nervous system reflects the physical properties of stimuli and does not often depend on the behavioral situation or performance task. Attempts to modify responses of skin receptors by various ways of directing the attention of subjects were reported. Four subjects were attached to gunsten electrodes and given 1 to 8 tests involving light and vibration, while reactions of nerve fibers were recorded. The subjects performed the tasks of either estimating the magnitude of the stimulus, or identifying exceptional sound stimuli in a group. It is indicated that the tasks caused the responses of skin mechanoreceptors to vary, with the function of determining vibration magnitude resulting in lower thresholds, more responses and shorter latent periods. The central effects were related to direct somatic or sympathetic connections to the receptors or changes in mechanical properties of the skin. It is shown that mechanoreceptors do not simply transmit in formation on physical properties, but respond to central mood effects and external influences. E.A.K.

N85-20636# Joint Publications Research Service, Arlington, Va.
EFFECTS OF HYPOTHERMIA ON BRAIN METABOLISM Abstract Only **c52**
E. Z. Emirbekov, S. P. Lvova, and R. A. Abdullaev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 54 Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 15, no. 4, Oct. - Dec. 1984 p 85-99 Original language doc. was announced in IAA as A85-14875 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

The published literature concerning the effect of general hypothermia on the energy, nitrogen-protein, and lipid metabolism in the brains of warm-blooded animals is reviewed along with original experimental results. A theory is developed according to which the neurochemical mechanisms underlying the effect of hypothermia are expressed in the disturbance of microcirculation: a reduction in the utilization of macroergic substances; low-temperature blocking of polysynaptic neuronal pathways; the disturbance of membrane-synaptic transmission; the disturbance of membranes by the peroxidation of lipids; the discoordination of enzyme activity; and changes in the ratios of hydrocarbon-phosphor and nitrogen metabolites. L.M. (IAA)

N85-20637# Joint Publications Research Service, Arlington, Va.
EFFECT OF PROLONGED HUNGER DURING EXPERIMENTAL HIKES Abstract Only **c52**
V. Radzhabli *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 54 Transl. into ENGLISH from Sov. Rossiya (Moscow), 2 Oct. 1984 p 6 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

Reactions and physiological changes in persons taking long hikes or canoe trips while fasting were studied to develop a model of behavior of tourist groups without food in an emergency in a remote area. The first stage of the experiment involved a 15 day trip of 537 kilometers by experienced hikers and five novices, including 2 women, participated in the second stage of the experiment. It was found that hunger itself does not decrease the capacity of persons to endure psychological and physiological stress but increases it. Personal interactions of members of the experimental group also helped to produce a positive physiological and psychological effect. E.A.K.

N85-20211# Joint Publications Research Service, Arlington, Va.
RESEARCH IN ENVIRONMENTAL BIOLOGY REVIEWED
Deming Wang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 78-92 Transl. into ENGLISH from Huanjing Kexue (China), no. 6, 30 Dec. 1983 p 61-67 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20650*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SUSCEPTIBILITY OF CAT AND SQUIRREL MONKEY TO MOTION SICKNESS INDUCED BY VISUAL STIMULATION: CORRELATION WITH SUSCEPTIBILITY TO VESTIBULAR STIMULATION
N. G. Daunton, R. A. Fox (San Jose State Univ., Calif.), and G. H. Crampton (Wright State Univ., Dayton, Ohio) *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 5 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-20638*# National Aeronautics and Space Administration, Washington, D. C.
RADIATION SAFETY OF CREW AND PASSENGERS OF AIR TRANSPORTATION IN CIVIL AVIATION. PROVISIONAL STANDARDS
A. F. Aksenov and A. I. Burnazyan Mar. 1985 17 p Transl. into ENGLISH of "Radiatsionnoy Bezopasnosti Letnogo Personala i Passazhirov Vozdushnogo Transporta Grazhdanskoy Aviatsii, Vremennyye Normy" rept. VNRBGA-75, Moscow 1975 17 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original document prepared by Ministry of Health, Moscow
(Contract NASw-4004)
(NASA-TM-77610; NAS 1.15:77610; VNRBGA-75) Avail: NTIS HC A02/MF A01 CSCL 06R

The purpose and application of the provisional standards for radiation safety of crew and passengers in civil aviation are given. The radiation effect of cosmic radiation in flight on civil aviation air transport is described. Standard levels of radiation and conditions of radiation safety are discussed. E.A.K.

N85-20639*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PHOTOREFRACTOR OCULAR SCREENING SYSTEM Patent Application
Joseph H. Kerr (Electro-Optics Consultants, Inc.) and John R. Richardson, inventors (to NASA) Filed 28 Sep. 1984 25 p
(NASA-Case-MFS-26011-1SB; NAS 1.71:MFS-26011-1SB; US-Patent-Appl-SN-655605) Avail: NTIS HC A02/MF A01 CSCL 06B

A method and apparatus for detecting human eye defects, particularly detection of refractive error is presented. Eye reflex is recorded on color film when the eyes are exposed to a flash of light. The photographs are compared with predetermined standards, to detect eye defects. NASA

N85-20640# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France). Div. Histopathologie Aeronautique.
PATHOPHYSIOLOGICAL STUDY OF POISONING DUE TO THERMAL DEGRADATION OF MATERIALS
C. Nogues, C. Fouet, and M. J. Armand Jun. 1984 36 p refs In FRENCH; ENGLISH summary
(Contract DRET-82.1073)
(CERMA-84-15) Avail: NTIS HC A03/MF A01

Fire toxicity of aircraft seats and components was investigated in controlled thermal degradation of polyurethane foam and/or wool compounds whose inhalation causes respiratory distress. The injury substrate is pulmonary edema with protein loss. The severity of injuries varies with the type of material and the concentration of the main toxic compounds such as carbon monoxide, nitrogen oxides, and cyanhydric acid. Author (ESA)

N85-20641# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France). Div. de Biochimie-Toxicologie.
MATERIAL THERMOLYSIS PRODUCT TOXICITY: DEFINITION OF A HAZARD EVALUATION METHODOLOGY
J. P. Delcroix, P. Picart, and M. Guerbet Mar. 1984 214 p refs

In FRENCH; ENGLISH summary
(Contract DRET-80.1038)
(CERMA-84-08) Avail: NTIS HC A10/MF A01

A methodology for the evaluation of material thermal degradation product toxicity for hypertacute alveolar toxicity under controlled ventilation, and behavioral toxicity under spontaneous ventilation was developed. Biological tests were performed. The thermolysis method was sample exposure to various temperature increase rates. The results led to a hazard classification of seven materials - by decreasing order: wool, rigid and flexible polyurethanes, plywood, PVC, poplar, and polycarbonate. Author (ESA)

N85-20642# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
MOTION SICKNESS: MECHANISMS, PREDICTION, PREVENTION AND TREATMENT
Loughton, England Nov. 1984 174 p refs In ENGLISH and FRENCH Symp. held in Williamsburg, Va., 3-4 May 1984
(AGARD-CP-372; ISBN-92-835-0369-4) Avail: NTIS HC A08/MF A01

Motion sickness continues to be a significant operational problem in the armed forces of the NATO countries. Space motion sickness has emerged as a major operational concern in the short duration space shuttle flights, with nearly 50% of all crew members experiencing some symptoms. Recent developments in understanding etiological factors contributing to air, sea, car, simulator and space sickness are reported. Neurological mechanisms mediating motion sickness are identified, predictive tests of susceptibility are discussed, and the prevention and treatment of motion sickness are addressed. Laboratory findings are identified which can be incorporated into programs for alleviating motion sickness under operational conditions. For individual titles, see N85-20643 through N85-20660.

N85-20643# Rockefeller Univ., New York.
NEUROPHYSIOLOGICAL CORRELATES OF MOTION SICKNESS: ROLE OF VESTIBULOCEREBELLUM AND 'VOMITING CENTER' REANALYZED
Alan D. Miller and Victor J. Wilson *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 5 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

Unexpected findings were obtained regarding the role of the nodulus and uvula of the vestibulocerebellum in vestibular-induced vomiting and the existence of a readily identifiable, discretely localized vomiting center. Sinusoidal electrical stimulation of the vestibular labyrinths of decerebrate cats could produce vomiting and related activity similar to that observed during motion sickness. These symptoms occurred in animals with lesions of the posterior cerebellar vermis that included the nodulus and uvual, indicating, by analogy, that these structures are not essential for the development of many symptoms of motion sickness in intact animals. Electrical stimulation of the brainstem was used in an attempt to localize a vomiting center to a restricted anatomical region. Vomiting proved difficult to produce; a vomiting center, stimulation of which evoked readily reproducible results, could not be identified. R.S.F.

N85-20644# Brandeis Univ., Waltham, Mass. Spatial Orientation Lab.
INFLUENCE OF GRAVITOINERTIAL FORCE LEVEL ON APPARENT MAGNITUDE OF CORIOLIS CROSS-COUPLED ANGULAR ACCELERATIONS AND MOTION SICKNESS
James R. Lackner and Ashton Graybiel *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 7 p refs Prepared in cooperation with Naval Air Station, Pensacola, Fla. (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A09

The Skylab astronauts showed a great decrease in susceptibility to motion sickness during exposure to Coriolis cross-coupled angular accelerations when tested in orbital flight. In order to determine whether this decreased susceptibility is related entirely to adaptation or in part to changes in vestibular and function, subjects were tested in the free fall and high force phases of parabolic flight maneuvers. Susceptibility to motion sickness during Coriolis stimulation as a function of force level and the perceived intensity of Coriolis cross-coupled angular accelerations as a function of force level were measured. Subjects exhibited fewer and less severe symptoms of motion sickness when tested in free fall than they did for the same Coriolis stimulation in 1G. They exhibited much earlier and more severe symptoms when tested in 2G. They exhibited much earlier and more severe symptoms when tested in 2G. It is concluded that part of the Skylab astronauts' inflight decrease in susceptibility to Coriolis stimulation was related to alterations in vestibular and sensorimotor control that occur immediately during exposure to microgravity force levels. R.S.F.

N85-20645# University Hospital, Copenhagen (Denmark).
VESTIBULAR AND OCULOMOTOR FUNCTION DURING Gz VARIATIONS
S. Vesterhauge, A. Mansson, and T. Staehr Johansen *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 5 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

Ten normal subjects were exposed to G-force variations during parabolic flights and turns in a SAAB Supporter aircraft. A vertical head drift accompanied by a vertical eye drift was recorded in all subjects. The eye drift was most prominent during the hyper-G phase of the parabolic manoeuvres. Compensatory eye movements were induced by horizontal head rotations. No statistical significant changes could be demonstrated in this reflex. Horizontal oculomotor saccades were induced with a visual distance of + or 10 deg. A significant increase of the latency time could be demonstrated during the weightless phase of the parabolas. It is concluded that spontaneous eye and head drift and disturbances in voluntary eye movements might contribute to the development of motion sickness during combat maneuvers and space flight. R.S.F.

N85-20646*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PREDICTION OF THE SPACE ADAPTATION SYNDROME
M. F. Reschke, J. L. Homick, P. Ryan, and E. C. Moseley *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 19 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

The univariate and multivariate relationships of provocative measures used to produce motion sickness symptoms were described. Normative subjects were used to develop and cross-validate sets of linear equations that optimally predict motion sickness in parabolic flights. The possibility of reducing the number of measurements required for prediction was assessed. After describing the variables verbally and statistically for 159 subjects, a factor analysis of 27 variables was completed to improve understanding of the relationships between variables and to reduce the number of measures for prediction purposes. The results of this analysis show that none of variables are significantly related to the responses to parabolic flights. A set of variables was selected to predict responses to KC-135 flights. A series of discriminant analyses were completed. Results indicate that low, moderate, or severe susceptibility could be correctly predicted 64 percent and 53 percent of the time on original and cross-validation samples, respectively. Both the factor analysis and the discriminant analysis provided no basis for reducing the number of tests. R.S.F.

N85-20647# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
PREDICTION OF SEASICKNESS SUSCEPTIBILITY
W. Bles, H. A. A. deJong (Academic Medical Centre, Amsterdam), and W. J. Oosterveld (Academic Medical Centre, Amsterdam) *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 6 p refs (For primary document see N85-20642 11-52)

Avail: NTIS HC A08/MF A01

Thirty-nine subjects, suffering from chronic seasickness, and 21 controls were submitted to several tests in order to find parameters for the prediction of seasickness susceptibility. Routine electronystagmography examination revealed a labyrinthine predominance of more than 30% with caloric irrigation in about 15% of the seasickness susceptibles, suggesting a higher incidence of chronic motion sickness susceptibility in subjects with a labyrinthine imbalance than in normals. Cupulometry revealed identical slopes of the sensation cupulogram for both groups. No difference in slope was found for the nystagmus cupulogram either. The time constant of the 'velocity storage mechanism' also covered the same range for both groups. Stabilometry performed in a tilting room suggested that seasickness susceptibles are more visually oriented than the controls as revealed by the visually induced postural instability. R.S.F.

N85-20648# Naval Aerospace Medical Research Lab., Pensacola, Fla.

LABORATORY TESTS OF MOTION SICKNESS SUSCEPTIBILITY

J. M. Lentz *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 9 p refs (For primary document see N85-20642 11-52)

Avail: NTIS HC A08/MF A01

Five laboratory tests of motion sickness susceptibility that were evaluated over the years at the Naval Aerospace Medical Research laboratory in Pensacola are reviewed. These tests, involving Coriolis stimuli, off-vertical rotation, visual/vestibular interactions, were developed with the objective of predicting individual susceptibility to airsickness and space sickness. Individual tests which are discussed include: brief vestibular disorientation test, coriolis sickness susceptibility test, sudden-stop vestibulovisual test, tilted-axis rotation test, and the visual/vestibular interaction test. B.G.

N85-20649# Naval Aerospace Medical Research Lab., Pensacola, Fla.

RESULTS OF A LONGITUDINAL STUDY OF AIRSICKNESS INCIDENCE DURING NAVAL FLIGHT OFFICER TRAINING

W. C. Hixson, F. E. Guedry, Jr., and J. M. Lentz *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 13 p refs (For primary document see N85-20642 11-52)

Avail: NTIS HC A08/MF A01

The results of a longitudinal study of airsickness in a large sample population of Naval Flight Officers (NFOs) being trained to perform various nonpilot flighty duties prior to assignment to operational fleet squadrons are outlined. The acquisition of airsickness data on an individual student basis was stressed as training progressed from the basic/primary level through the advanced/secondary level to the fleet readiness squadron phase for each of the major NFO training pipelines. The primary objectives were to define the incidence of airsickness in each of the training squadrons and to identify differences in the motion stress exposure associated with the different pipelines that can affect decisions on the initial selection and assignment of NFO candidates. A secondary objective was to relate the inflight airsickness data to the results of several short tests of motion reactivity given to a segment of the study population prior to their beginning flight training. Author

N85-20650*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SUSCEPTIBILITY OF CAT AND SQUIRREL MONKEY TO MOTION SICKNESS INDUCED BY VISUAL STIMULATION: CORRELATION WITH SUSCEPTIBILITY TO VESTIBULAR STIMULATION c51

N. G. Daunton, R. A. Fox (San Jose State Univ., Calif.), and G. H. Crampton (Wright State Univ., Dayton, Ohio) *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 5 p refs (For primary document see N85-20642 11-52)

Avail: NTIS HC A08/MF A01

Experiments in which the susceptibility of both cats and squirrel monkeys to motion sickness induced by visual stimulation are documented. In addition, it is shown that in both species those individual subjects most highly susceptible to sickness induced by passive motion are also those most likely to become motion sick from visual (optokinetic) stimulation alone. Author

N85-20651# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).

SUSCEPTABILITY TO KINETOSES AND THE AMPLITUDE PERCEIVED FROM SENSORY ILLUSIONS [SUSCEPTIBILITE AUX CINETOSES ET AMPLITUDE PERCUE DES ILLUSIONS SENSORIELLES]

A. Leger *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 10 p refs In FRENCH (For primary document see N85-20642 11-52)

Avail: NTIS HC A08/MF A01

Coriolis accelerations provoked by the starting and stopping of a centrifuge entail a strong illusory sensation of angular displacement. The amplitude of these sensations was studied in two groups of subjects who were either receptive or nonreceptive to motion sickness. The axes of application of the load factor was varied with respect to the head. Considerable differences of amplitude were noticed between the two groups for the series of protocols studied. The orientation of the load factor strongly influences the appearance of the kinetosis syndrome.

Transl. by A.R.H.

N85-20652# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

PREFLIGHT AND POSTFLIGHT MOTION SICKNESS TESTING OF THE SPACELAB 1 CREW

K. E. Money, D. G. Watt (McGill Univ., Montreal, Quebec), and C. M. Oman (Massachusetts Inst. of Tech., Cambridge) *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 8 p refs (For primary document see N85-20642 11-52)

Avail: NTIS HC A08/MF A01

The Four Spacelab 1 payload crew members, as experimental subjects, were exposed to a variety of motion sickness tests. Contrary to expectation, the crew member who was most susceptible to these tests was the least susceptible to space motion sickness, and the crew member who was most susceptible to space motion sickness was one of the least susceptible to these tests. On the third day after returning from the mission, one of the preflight tests (KC 135) was repeated, and all of the crew members were found to be non-susceptible. Statements of generalities will have to wait for the accumulation of more experimental subjects. Author

N85-20653# Essex Corp., Orlando, Fla.

SIMULATOR SICKNESS: REACTION TO A TRANSFORMED PERCEPTUAL WORLD. 6: PRELIMINARY SITE SURVEYS

Robert S. Kennedy, Alvah C. Bittner, Jr. (Naval Biodynamics Lab., New Orleans, La.), Lawrence H. Frank (Naval Training Equipment Center, Orlando, Fla), Robert W. Hoot, Michael E. McCauley, and Terrance A. Binks (Marine Corps Air Station, Jacksonville, N.C.) *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 11 p refs (For primary document see N85-20642 11-52)

Avail: NTIS HC A08/MF A01

There were numerous recent documented and anecdotal reports of aircrews experiencing psychophysiological disturbances, visual illusions and sickness following the use of flight simulators. Symptoms of simulator sickness occur not only during flight, but in some individuals, have lasted up to several hours post exposure. Furthermore, simulator aftereffects may be delayed; some aircrews report symptom onset as late as eight to ten hours post utilization. Incidents of simulator sickness were documented in fighter, attack, patrol and helicopter simulators. These occurrences were reported in both motion-base and fixed-base simulators, to pilots and other aircrewmen, as well as instructors. Simulator sickness represents a major obstacle to obtaining the full training potential from the

vast inventory of flight simulators currently in use and under development. Data on pilot experience and exposure factors, symptomatology, scores on postural disequilibrium tests, video-game performance and engineering design aspects in two different Navy helicopter simulators are presented, along with a brief review of past simulator sickness studies. B.G.

N85-20654# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
SPACE MOTION SICKNESS MONITORING EXPERIMENT: SPACELAB 1
Charles M. Oman, Byron K. Lichtenberg, and Kenneth E. Money (Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario) *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 21 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

Symptoms and signs of space motion sickness and fluid shift were observed by 4 specially trained crewmembers on the physically demanding 10 day flight of Space Shuttle/Spacelab 1 launched on 11/28/83. Anonymous but detailed firsthand reports are presented. Three crewmen experienced persistent overall discomfort, and vomited repeatedly. Symptom pattern was generally similar to that seen in the individuals preflight, except that: prodromal nausea was brief or absent in some cases; facial pallor and cold sweating were usually absent; one subject experienced uncomfortable stomach elevation. However, symptoms were clearly modulated by head movement, were exacerbated by unfamiliar visual cues, and could be reduced by physical restraint providing contact cues around the body. Drugs known to be effective in preventing motion sickness were judged helpful in limiting symptoms, including vomiting. Results support the view that space sickness is a form of motion sickness. Author

N85-20655*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE ADAPTATION SYNDROME: INCIDENCE AND OPERATIONAL IMPLICATIONS FOR THE SPACE TRANSPORTATION SYSTEM PROGRAM
J. L. Homick, M. F. Reschke, and J. M. Vanderploeg *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 6 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

Better methods for the prediction, prevention, and treatment of the space adaptation syndome (SAS) were developed. A systematic, long range program of operationally oriented data collection on all individuals flying space shuttle missions was initiated. Preflight activities include the use of a motion experience questionnaire, laboratory tests of susceptibility to motion sickness induced by Coriolis stimuli and determinations of antimotion sickness drug efficacy and side effects. During flight, each crewmember is required to provide a daily report of symptom status, use of medications, and other vestibular related sensations. Additional data are obtained postflight. During the first nine shuttle missions, the reported incidence of SAS has been48%. Self-induced head motions and unusual visual orientation attitudes appear to be the principal triggering stimuli. Antimotion sickness medication, was of limited therapeutic value. Complete recovery from symptoms occurred by mission day three or four. Also of relevance is the lack of a statistically significant correlation between the ground based Coriolis test and SAS. The episodes of SAS have resulted in no impact to shuttle mission objectives and, no significant impact to mission timelines. E.A.K.

N85-20656# Naval Biodynamics Lab., New Orleans, La.
ANALYSIS OF HEAD MOTION DURING SIMULATED, ROUGH WATER OPERATION OF A 2200 TON SURFACE EFFECT SHIP
William R. Anderson, Gilbert C. Willems, and John C. Guignard *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 14 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

Nineteen Navy volunteers were exposed, for periods up to 48 hours, to simulated motion environments predicted for a 2,000,000 Kg surface effect ship. Surface effect ships, which are supported by a cushion of air, operate at high speeds and produce motion strongly influenced by the dynamics of the air cushion. The motions of both the environment and the head of each volunteer were measured during scheduled 5 minute intervals and the relationship of head motion to impending emesis was investigated. The time series data and the frequency spectra were examined to identify variability in head response resulting from: repetitions with the same subject, repetitions with different subjects, repetitions with a subject in different position, repetitions simulating different ship operating conditions, repetitions with and without pitch and roll motions, differences between well and sick subjects, fatigue, and progression to emesis. Heave, pitch and roll motions in the range of 0.05 to 1.5 Hz were simulated. It is indicated that a correlation between spontaneous head motion and motion sickness exist. The utility of studying the effects of motion in a controlled laboratory environment was demonstrated. E.A.K.

N85-20657# Institute of Aviation Medicine, Farnborough (England).
A DOUBLE BLIND COMPARATIVE TRIAL OF POWDERED GINGER ROOT, HYOSINE HYDROBROMIDE, AND CINNARIZINE IN THE PROPHYLAXIS OF MOTION SICKNESS INDUCED BY CROSS COUPLED STIMULATION
J. R. R. Stott, M. P. Hubble, and M. B. Spencer *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 6 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

The relative effectiveness of powdered ginger root (1G), hyoscine (0.6 mg), cinnarizine (15 mg) and a placebo increase of the tolerance of subjects to the development of motion sickness symptoms induced by cross coupled stimulation. In order to assess the effect of each drug on performance, a range of tests was carried out in the period between 90 minutes and 2 hours after taking the drug. The effectiveness of hyoscine in delaying the onset of motion sickness symptoms is confirmed and cinnarizine is shown to be similarly effective. The study failed to substantiate a previous report that powderd root ginger is of value in the prophylaxis of motion sickness. Significant differences in the results of performance tests were found only after the administration of hyoscine, which produced a small decrease in subjective alertness and a reduction in the velocity of saccadic eye movements. E.A.K.

N85-20658# Institute of Aviation Medicine, Farnborough (England).
THE CURRENT STATUS OF THE RAF PROGRAMME OF DENSENSITISATION FOR MOTION SICK AIRCREW
J. R. R. Stott and M. Bagshaw *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 9 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

The desensitization to motion sickness program consists of a ground phase and a flying phase. Additional motion stimuli were incorporated into the ground phase of treatment and the flying phase is carried out in the high performance Hunter T7 aircraft. Comparison of the results of follow up for the period 1981 to 1983 with those for 1974 to 1980 indicates an improvement in overall success rate arid shows a significant increse in the number of pilots who progress to fly in the demanding motion environment of fast jets. E.A.K.

N85-20659# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany). Dept. 6 Aviation Psychology.
PSYCHOLOGICAL COMPONENTS IN THE DEVELOPMENT AND PREVENTION OF AIR SICKNESS
Reiner W. Kemmler *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 8 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

The behavior of motion sick aircrew members was analyzed from 23 case studies. Situational context variables and their interaction with individual dispositions, behavior regulation patterns,

coping mechanisms and self control techniques are discussed. It seems that sensitivity to motion is not the only criterion in the development of motion sickness. Countermeasures and their effects are described. Daily exercise of various of behavior regulation to build up successive adaptation to motion stress should enable persons to cope with motion sickness-producing situations in flight. E.A.K.

N85-20660# Aerospace Medical Div., Brooks AFB, Tex.
BIOFEEDBACK TREATMENT OF AIRSICKNESS: A REVIEW
David R. Jones and Bryce O. Hartman *In* AGARD Motion Sickness: Mechanisms, Prediction, Prevention and Treatment Nov. 1984 4 p refs (For primary document see N85-20642 11-52)
Avail: NTIS HC A08/MF A01

Biofeedback as a treatment for air sickness is reviewed. Recognition of early symptoms of motion sickness and the use of relaxation techniques are outlined. The subjects are taught how to control the symptoms when they occur. It is found that the use of biofeedback modalities in the dynamic Coriolis chair environment is more effective in returning fliers to operational flying than relaxation training and desensitization alone. E.A.K.

N85-20661# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
6 Nov. 1984 58 p Transl. into ENGLISH from various Chinese articles
(JPRS-CST-84-036) Avail: NTIS HC A04/MF A01

Progress in Science and technology in the Peoples' Republic of China is reported. Topics discussed include: applied sciences in environment pollution caused by coal mines, and the life sciences in military aerospace medicine. For individual titles, see N85-20662 through N85-20663.

N85-20662# Joint Publications Research Service, Arlington, Va.
AVIATION MEDICINE'S ROLE IN MODERN AIRFORCE DISCUSSED
Xu Weipu *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-036) 6 Nov. 1984 p 41-47 Transl. into ENGLISH from Jiefangjun Yixue Zazhi (Beijing), no. 2, 20 Apr. 1984 p 143-144 (For primary document see N85-20661 11-52)
Avail: NTIS HC A04/MF A01

Progress in military aviation medicine is discussed. The characteristics of military aviation are summarized as follows: (1) high performance military aircraft; (2) cockpit space restriction and stress; and (3) good physical condition of pilot. The different topics examined include: aerospace environment physiology; biodynamics; psychology and work efficiency; flight work hygiene; clinical aviation medicine; and logistic air force health services. E.A.K.

N85-20663# Joint Publications Research Service, Arlington, Va.
SYMPOSIUM ON MILITARY AVIATION MEDICINE SUMMARIZED
Xu Weipu *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-036) 6 Nov. 1984 p 48-55 Transl. into ENGLISH from Jiefangjun Yixue Zaxhi (Beijing), no. 2, 20 Apr. 1984 p 148-150 (For primary document see N85-20661 11-52)
Avail: NTIS HC A04/MF A01

Military aviation in China is discussed. Topics presented include: (1) aviation physiology and onflight protective life support; (2) examintation of cardiovascular systems in flight personnel; (3) vestibular functioning, otological and opthalmological examination and its clinical treatment; and (4) flight health safequards. E.A.K.

N85-20351*# National Aeronautics and Space Administration, Washington, D. C.
PHYSIOLOGICAL CONSIDERATIONS OF ARTIFICIAL GRAVITY
D. Bryant Cramer *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 13 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 06S

N85-20358*# McDonnell-Douglas Corp., St. Louis, Mo.
SUMMARY PRESENTATION TO THE ARTIFICIAL GRAVITY PANEL
George Butler *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 1 Mar. 1985 11 p (For primary document see N85-20339 11-37)
Avail: NTIS HC A13/MF A01 CSCL 06S

N85-20365*# McDonnell-Douglas Corp., St. Louis, Mo.
REPORT OF THE ARTIFICIAL GRAVITY PANEL
George Butler, Bob Freitag (NASA, Washington), Dox Doxiadis (Rockwell Corp.), Dave R. Criswell (Calspace), Charles Tang (JPL, California Inst. of Tech., Pasadena), Dennis Fielder (NASA. Johnson Space Center), John Gille (Martin Marietta), Paul Penzo (JPL, California Inst. of Tech., Pasadena), Ken Kroll (NASA. Johnson Space Center), Luigi Napolitano (Naples Univ., Italy) et al *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 36 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 06S

N85-20366*# National Aeronautics and Space Administration, Washington, D. C.
PHYSIOLOGICAL CONSIDERATIONS OF ARTIFICIAL GRAVITY
D. B. Cramer *In* NASA. Marshall Space Flight Center Appl. of Tethers in Space, Vol. 2 Mar. 1985 20 p (For primary document see N85-20361 11-37)
Avail: NTIS HC A14/MF A01 CSCL 06S

N85-20629# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL SYSTEM THEORY IN PRACTICE Abstract Only
A. S. Sosnovskiy *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 49-50 Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 15, no. 4, Oct. - Dec. 1984 p 119-124 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

N85-20630# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF HUMAN MASSETER UNDER CONDITIONS OF HYPOKINESIA Abstract Only
V. A. Solovyev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 50 Transl. into ENGLISH from Ark. Anat. Gistol. i Embriol. (Leningrad), no. 9, Sep. 1984 p 77-83 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

N85-20632# Joint Publications Research Service, Arlington, Va.
PSYCHOLOGICAL ASPECTS OF PHENOMENON OF OF SPATIAL SYNCHRONIZATION OF EEG POTENTIAL Abstract Only
M. N. Livanov and N. Ye. Sviderskaya *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 51-52 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 5, Sep. - Oct. 1984 p 71-83 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

N85-20633# Joint Publications Research Service, Arlington, Va.
TOPOGRAPHY OF HUMAN BRAIN ELECTRIC POTENTIALS AND DOMINANCE Abstract Only
V. A. Doroshenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 52 Transl. into ENGLISH from Fiz. Zh. (Leningrad), no. 10, Oct. 1984 p 1361-1365 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

N85-20634# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL SIGNIFICANCE OF SOME EEG PARAMETERS AND DOMINANT PRINCIPLE Abstract Only
I. Ye. Kanunikov and A. R. Sharipov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 53 Transl. into ENGLISH from Fiz. Zh. (Leningrad), no. 10,

1984 p 1366-1373 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

N85-20635# Joint Publications Research Service, Arlington, Va.
EFFECTS OF TASKS ON RESPONSES OF HUMAN SKIN MECHANORECEPTORS Abstract Only
K. Soininen, T. Yarvilekhto, Yu. I. Aleksandrov, and V. B. Shvyrkov *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 53 Transl. into ENGLISH from Psikhologicheskiy Zh. (Moscow), v. 5, no. 5, Sep. - Oct. 1984 p 104-110 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

N85-20636# Joint Publications Research Service, Arlington, Va.
EFFECTS OF HYPOTHERMIA ON BRAIN METABOLISM Abstract Only
E. Z. Emirbekov, S. P. Lvova, and R. A. Abdullaev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 54 Transl. into ENGLISH from Usp. Fiz. Nauk (Moscow), v. 15, no. 4, Oct. - Dec. 1984 p 85-99 Original language doc. was announced in IAA as A85-14875 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

N85-20637# Joint Publications Research Service, Arlington, Va.
EFFECT OF PROLONGED HUNGER DURING EXPERIMENTAL HIKES Abstract Only
V. Radzhabli *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-010) 25 Feb. 1985 p 54 Transl. into ENGLISH from Sov. Rossiya (Moscow), 2 Oct. 1984 p 6 (For primary document see N85-20628 11-51)
Avail: NTIS HC A05/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-20664# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A METHOD FOR REDUCTION OF AMBIGUITY IN SEGMENTATION OF IMAGES M.S. Thesis - Aug. 1984 [UM METODO PARA REDUCAO DE AMBIGUIDADE EM SEGMENTACAO DE IMAGENS]
Fernando Antonio Araujo Mota Jan. 1985 110 p refs In PORTUGUESE; ENGLISH summary
(INPE-3394-TDL/186) Avail: NTIS HC A06/MF A01

Nowadays, in the development of automatic systems of visual perception, a set of phases that characterize the computational modelling of the perceptive process are distinguished. During the segmentation and interpretation phases, besides the compromise regarding the elimination of inconsistencies, there appears the ambiguity problem. An approach is proposed to deal with those questions, in the level of the identification of the object, using the semantic relationships and iterated parallel operations (relaxation operations) upon a discrete model that labels segments (labelled graphs). It is intended to reduce to the maximum the ambiguity through a single process of successive elimination, instead of a process for each possible segmentation. The work is based mainly in the algebraic characterization of the relaxation operator and in the formal treatment, through discrete algebra, which puts into evidence its computational validity. R.J.F.

N85-20665# Air Force Human Resources Lab., Brooks AFB, Tex.
CLOSE AIR SUPPORT MISSION: DEVELOPMENT OF A UNITARY MEASURE OF PILOT PERFORMANCE Interim Report, Feb. - Jul. 1984
G. S. Thomas Nov. 1984 22 p
(AF Proj. 1123)
(AD-A149285; AFHRL-TR-84-39) Avail: NTIS HC A02/MF A01 CSCL 05/9

This effort demonstrated the feasibility of combining components of the Close Air Support (CAS) mission in a valid composite measure of pilot performance. Combat-ready, A-10 aircraft pilots judged overall mission performance from outcomes typical of those obtained in the Advanced Simulator for Pilot Training (ASPT) based on pilot survival and the number and type of targets destroyed. A linear regression analysis of the judgments resulted in a mathematical formula that assigned differential values to the mission components. The formula was cross-validated using a separate group of A-10 pilots who judged performance for a different set of CAS mission outcomes. To test the sensitivity of the scoring algorithm to CAS training, data from a previous study on pilots trained in ASPT were reanalyzed using the formula. CAS performance, as calculated by the algorithm, improved significantly across training trials. This procedure for developing a unitary performance metric may be useful in other training research and development when a composite measure is desirable for evaluation purpose.
GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-20666*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELBOW AND KNEE JOINT FOR HARD SPACE SUITS AND THE LIKE Patent Application
Hubert C. Vykukal, inventor (to NASA) Filed 20 Dec. 1984 22 p
(NASA-Case-ARC-11610-1; NAS 1.71:ARC-11610-1;
US-Patent-Appl-SN-684190) Avail: NTIS HC A02/MF A01 CSCL 06K

An elbow or knee joint for a hard space suit or similar usage is formed of three serially-connected rigid sections which have truncated spherical configurations. The ends of each section form solid geometric angles, and the sections are interconnected by hermetically-sealed ball bearings. The outer two sections are fixed together for rotation in a direction opposite to rotation of the center section. A preferred means to make the outer sections track each other in rotation comprises a rotatable continuous bead chain which engages sockets circumferentially spaced on the facing sides of the outer races of the bearings. The joint has a single pivot point and the bearing axes are always contained in a single plane for any articulation of the joint. Thus flexure of the joint simulated the coplanar flexure of the knee or elbow and is not susceptible to lockup. NASA

N85-20667# Clarke Ambrose, Inc., Knoxville, Tenn.
MAN/MACHINE INTERFACE FOR A NUCLEAR CASK REMOTE HANDLING CONTROL STATION: SYSTEM DESIGN REQUIREMENTS
M. M. Clarke, J. G. Kreifeldt, and J. V. Draper 9 Jul. 1984 91 p refs
(Contract DE-AC06-76FF-02170)
(DE85-000256; HEDL-7465; TTC-0499) Avail: NTIS HC A05/MF A01

Design requirements are presented for a control station of a proposed semi-automated facility for remote handling of nuclear waste casks. Functional and operational man/machine interface include controls, displays, software format, station architecture, and work environment. In addition, some input is given to the design of remote sensing systems in the cask handling areas.
DOE

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N85-20668# Grenoble-1 Univ. (France).
ANNALS OF THE FOURIER INSTITUTE, VOLUME 34, NO. 4 [ANNALES DE L'INSTITUT FOURIER, TOME 34, FASCICULE 4]
B. Malgrange, ed., L. Boutet deMonvel, ed., P. Cartier, ed., Y. Colin deVerdiere, ed., C. Godbillon, ed., B. Gross, ed., I. Kupka, ed., J. Martinet, ed., V. Poenaru, ed., and N. Varopoulos, ed. Luisant, France Imprimerie Durand 1984 272 p refs In ENGLISH and FRENCH
Avail: NTIS HC A12/MF A01

Articles addressing various topics in mathematics are presented. Subject areas include field theory, fibers, Fourier microdistributions, the generalization of Beurling algebras, commutators in C*-algebras, and Riemann foliations. For individual titles, see N85-20669 through N85-20678.

N85-20669# Grenoble-1 Univ. (France).
ON THE DISTRIBUTION OF INTEGRAL AND PRIME DIVISORS WITH EQUAL NORMS **c67**
B. Z. Moroz *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 1-17 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

In finite Galois extensions K sub 1, ..., k sub r) of Q with pairwise coprime discriminants the integral and the prime divisors subject to the condition N sub(k sub 1/Q) a sub 1 = ... = N sub(k sub r /q) a sub v are equidistributed in the sense of E. Hecke. M.G.

N85-20670# Grenoble-1 Univ. (France).
THE MILNOR LINK OF A LOCAL FIELD TO A PERFECT RESIDUE FIELD [L'ANNEAU DE MILNOR D'UN CORPS LOCAL A CORPS RESIDUEL PARFAIT] **c67**
Bruno Kahn *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 19-65 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

Let K be a complete discrete valuation field with residue field k. When k is perfect, the structure of K sub 2 (K) has been determined by C. C. Moore, J. E. Carroll and A. S. Merkurjev. Their results are here generalized to the case when k is perfect with positive characteristic p. Main results are: p (sup n)K sub 2 (K) is p-divisble for large enough (explicit) n; Milnor's group (top)K sub 2 (K) is discrete, explicitly determined; K sub 2 (K) has no prime to p torsion, and its p-torsion is explicitly determined. Results on Milnor's K-groups K sub m (K) are obtained as well; in particular, when m > or = 3, this group is p-divisble and has no p-torsion. M.G.

N85-20671# Grenoble-1 Univ. (France).
AN EXTENSION OF THE GLEASON PROBLEM IN PSEUDOCONVEX DOMAINS [SUR UNE EXTENSION DU PROBLEME DE GLEASON DANS LES DOMAINES PSEUDOCONVEXES] **c67**
Joaquin Ma. Ortega *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 67-74 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

It is proved that every (f is an element of A sup infinity (D)) has a decomposition F(z) - f(w) = the sum(1 to n) G sub i (z,w)(z sub i - w sub i), with g sub i being an element of A sup infinity bar-(D x D), for all pseudoconvex domains with a real-analytic boundary, as well as for pseudoconvex domains for which the result holds true locally. M.G.

N85-20672# Grenoble-1 Univ. (France).
CONTRIBUTION OF THE CUP-PRODUCT OF MILNOR'S FIBER WITH /f/ SUP 2 LAMBDA POLES [CONTRIBUTION DU CUP-PRODUIT DE LA FIBRE DE MILNOR AUX POLES DE /F/ SUP 2 LAMBDA] **c67**
Daniel Barlet *In its* Ann. of the Fournier Inst., Vol. 34, No. 4 1984 p 75-107 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

It is demonstrated that a non trivial cup-product between two Jordan blocks for a same eigenvalue of the monodromy acting on the cohomology of The Milnor's fiber of a german of holomorphic function f gives rise to high orders poles for the meromorphic extension of /f/ sup 2z. For the eigenvalue 1 this leads to the over-effective contribution phenomenon. M.G.

N85-20673# Grenoble-1 Univ. (France).
CLASSIC FOURIER MICRODISTRIBUTIONS IN THE REAL ANALYTIC CASE [MICRODISTRIBUTIONS DE FOURIER CLASSIQUES DANS LE CADRE ANALYTIQUE REEL] **c64**
Andre Piriou *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 109-134 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

A class of Fourier integral microdistributions is studied which is characterized by real analytic homogeneous phases functions, amplitudes which are truncated homomorphic realizations of classical analytic symbols, and integration contours along which the imaginary part of the phase has a suitable positivity property. Change of phase and transversal composition theorems, as in the C(infinity) case, are presented and it is shown how one can deduce the standard symbolic calculus of analytic pseudo-differential operators. M.G.

N85-20674# Grenoble-1 Univ. (France).
A CONTINUOUS HELSON SURFACE IN R3 **c64**
Detlef Mueller *In its* Ann. of the Fourier Inst., Vol. 34 No. 4 1984 p 135-150 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

For some time it has been known that there exist continuous Helson curves in R sup 2. This result, which is related to Lusin's rearrangement problem, had been proved first by Kahane in 1968 with the aid of Baire category arguments. Later McGehee and Woodward extended this result, giving a concrete construction of a Helson k-manifold in R sup nk for n > or = k + 1. A construction of a Helson 2-manifold in R sup 3 is presented. With modification, the method should even suffice to prove that there are Helson hypersurfaces in any R sup n. M.G.

N85-20675# Grenoble-1 Univ. (France).
GENERALIZATION OF BEURLING ALGEBRAS [GENERALISATION DES ALGEBRES DE BEURLING] **c64**
Phillipe Tchamitchian *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 151-168 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

The spaces A sub omega = F L (sup 2)(R sup n; omega-(x)dx), which are Banach algebras, are discussed. The main result is that the pointwise multipliers A sub omega are the functions belonging locally and uniformly to A sub omega if and only if A sub omega contains functions with compact supports. M.G.

N85-20676# Grenoble-1 Univ. (France).
FINITE PRODUCTS OF COMMUTATORS IN C* ALGEBRAS [PRODUITS FINIS DE COMMUTATEURS DANS LES C* ALGEBRES] **c64**
P. delaHarpe and G. Skandalis *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 169-202 refs IN FRENCH; ENGLISH

summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

Let A be a simple approximately finite dimensional C*-algebra with unit, let GL sub 1 (A) be the group of invertible elements and let U sub 1 (A) be that of unitaries in A. In a previous work a universal determinant delta sub T of A was defined which is a homomorphism from GL sub 1(A) onto an abelian group associated to A. It is shown that in element x in Gl sub 1 (A) or in U sub 1 (A) is a product of finitely many commutators if (and only if) x is an element of Ker(delta sub T). In particular, one may characterize the kernel of the canonical projection K sub 1 (A) approaches (top)K sub 1 (A). Other results are established about stable C*-algebras and infinite simple C*-algebras with unit. M.G.

N85-20677# Grenoble-1 Univ. (France).
RIEMANN FOLIATIONS ON SIMPLY CONNECTED VARIETIES [FEUILLETAGES RIEMANNIENS SUR LES VARIETES SIMPLEMENT CONNEXES] **c67**
Etienne Ghys *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 203-223 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

Riemannian foliations on simply connected manifolds are studied from a qualitative point of view. It is shown that these foliations can be approximated by generalized Seifert fibrations. It is then shown that for some bundle-like etric, the leaves of such foliations are minimal submanifolds. As an application, it is demonstrated that the only Riemannian foliations which are not Seifert fibrations, on spheres and projective spaces, are 1-dimensional. M.G.

N85-20678# Grenoble-1 Univ. (France).
TOPOLOGICAL TRIVIALITY OF VERSAL UNFOLDINGS OF COMPLETE INTERSECTIONS **c67**
James Damon *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 225-251 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

Algebraic and geometric conditions are obtained for the topological triviality of versal unfoldings of weighted homogeneous complete intersections along subspaces corresponding to deformations of maximal weight. These results are applied: to infinite families of surface singularities in C(4) which begin with the exceptional unimodular singularities, to the intersection of pairs of generic quadrics, and to certain curve singularities. The algebraic conditions are related to the operation of adjoining powers, a generalization for complete intersections of a special form of the Thom-Sebastiani operation. A duality result is proven which relates the Jacobian algebra of f being Gorenstein with N(F)* being principal, i.e. generated by one element (here F is obtained from f by adjoining powers, and N(F)* is the dual of the space of nontrivial infinitesimal deformations). M.G.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-20679*# Mitre Corp., McLean, Va. Metrek Div.
A GUIDELINES FOR ASSURING THE ADEQUACY APPROPRIATENESS OF SECURITY SAFEGUARDS IN SENSITIVE APPLICATIONS
F. G. Tompkins Sep. 1984 134 p refs
(Contract NASw-3425)
(NASA-CR-175489; NAS 1.26:175489; MTR-84W179) Avail: NTIS HC A07/MF A01 CSCL 09B

The Office of Management and Budget (OMB) Circular A-71, Transmittan Memorandum No. 1, requires that each agency establish a management control process to assure that appropriate administrative, physical and technical safeguards are incorporated into all new computer applications. In addition to security specifications, the management control process should assure that the safeguards are adequate for the application. The security activities that should be integral to the system development process are examined and the software quality assurance process is described. Security for software packages is also discussed. B.W.

N85-20680*# National Aeronautics and Space Administration. Pasadena Office, Calif.
REED-SOLOMON DECODER Patent Application
Charles R. Lahmeyer (JPL, California Inst. of Tech., Pasadena) Filed 21 Nov. 1984 35 p Sponsored by NASA
(NASA-Case-NPO-15982-1; NAS 1.71:NPO-15982-1; US-Patent-Appl-SN-673685) Avail: NTIS HC A03/MF A01 CSCL 09B

A Reed-Solomon decoder with dedicated hardware for five sequential algorithms was designed with overall pipelining by memory swapping between input, processing and output memories, and internal pipelining through the five algorithms. The code definition used in decoding is specified by a keyword received with each block of data so that a number of different code formats may be decoded by the same hardware. NASA

N85-20681# Softech, Inc., Fairborn, Ohio.
Ada COMPILER VALIDATION SUMMARY REPORT, DANSK DATAMATIK CENTER, VAX 11 COMPILER VERSION 1.1 Report, for 6 Nov. 1984 - 6 Nov. 1985
6 Nov. 1984 55 p
(Contract F33600-84-D-0280)
(AD-A149340; AVF-TAR-04.1184) Avail: NTIS HC A04/MF A01 CSCL 09/2

The purpose of this Validation Summary Report (VSR) is to present the results and conclusions of performing standardized tests of the Dansk Datamatik Center Compiler. The suite of tests known as the Ada Compiler Validation Capability (ACVC), Version 1.4, was used. The ACVC suite of tests is used to validate conformance of the compiler to ANSI/MIL-STD-1815A (Ada). The purpose of the testing is to ensure that the compiler properly implements legal language constructs and that it identify, reject from processing, and label illegal language constructs. The testing also identifies implementation-dependent behavior permitted by the standard. Six classes of tests are used. These tests are designed to perform checks at compile time, during execution, and at link time. The ACVC, Version 1.4, contains 2178 tests, of which 2011 were applicable to this implementation. Of the 2011 applicable tests, 73 were withdrawn due to the occurrence of errors in the tests. Results showed that all of the remaining 1938 valid tests were successfully passed by the Dansk Datamatik Center compiler. GRA

N85-20682# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
MICRO FOCUS, INTEL MICROPROCESSOR DEVELOPMENT SYSTEM MDS221 CIS COBOL; V4.5 Validation Summary Report
23 May 1984 34 p
(PB85-110823; OIT/FSTC-84/502) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, CIS COBOL; V4.5 running under the Digital Research 'CP/M', Version 2.2 (BIOS by Micro Focus) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20683# Federal Compiler Testing Center, Falls Church, Va.
PRIME COMPUTER, INCORPORATED, PRIME 750, BASICV REVISION 19.4 Validation Summary Report
9 Aug. 1984 10 p refs
(PB85-108074; OIT/FSTC-84/240-Rev) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Prime Computer, Inc, BASICV Revision 19.4 running under the PRIMOS Revision 19.3 Provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showning all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20684# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENTIFIC AFFAIRS
17 Feb. 1984 98 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-84-006) Avail: NTIS HC A05/MF A01

News items, abstracts, and scientific reports on aspects of scientific affairs including weather rocket launching, microcomputers, telecommunication, computer centers, personal computers, computer disks and electrical engineering are described. For individual titles, see N85-20685 through N85-20687.

N85-20685# Joint Publications Research Service, Arlington, Va.
DESCRIPTION OF 8048 MICROCOMPUTER OPERATION PUBLISHED
Michal Cernoch, Zdenek Stehno, and Vlasta Vybulkova *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-006) 17 Feb. 1985 p 2-51 refs Transl. into ENGLISH from Sdelovaci Tech. (Prague), no. 8, 1983 p 283-300 (For primary document see N85-20684 11-60)
Avail: NTIS HC A05/MF A01

The operating principles and characteristics of the 8048 single chip microcomputer, which is a typical representative of the 48 series are described. B.G.

N85-20686# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF COMPUTER CENTERS, EQUIPMENT DESCRIBED: PROBLEMS OF COMPUTER CENTERS
Donat Zatonski *In its* East Europe Rept: Sci. Affairs (JPRS-ESA-85-006) 17 Feb. 1985 p 71-83 Transl. into ENGLISH from Przeglad Tech. (Warsaw), no. 31, 31 Jul. 1983 p 14-15 (For primary document see N85-20684 11-60)
Avail: NTIS HC A05/MF A01

Computer service center capability; text editing computer screen; minicomputer system GS-80; lightweight computer disks, decline in computer equipment; and Meritum-1 personal computer are discussed. B.G.

N85-20687# Joint Publications Research Service, Arlington, Va.
LONG-RANGE ELECTRONICS PROGRAM OUTLINED c33
Stanislaw Stepien *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-85-006) 17 Feb. 1985 p 84-94 Transl. into ENGLISH from Przeglad Tech. (Warsaw), no. 46, 13 Nov. 1983 p 10-13 (For primary document see N85-20684 11-60)
Avail: NTIS HC A05/MF A01

The balance of materials and subassemblies for final products; integrated circuits; computerization of the national economy; entertainment electronics; development of a national telephone network; and projected goals for 1990 were discussed. B.G.

N85-20178# Joint Publications Research Service, Arlington, Va.
SIEMENS INTRODUCES FAST COMPUTER WITH PIPELINE ARCHITECTURE
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 8 Transl. into ENGLISH from Die Computer Zeitung (West Germany), 3 Oct. 1984 p 1 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-20688 Bayerische Akademie der Wissenschaften, Munich (West Germany). Deutsche Geodaetische Kommission.
CONTOUR LINE GENERALIZATION USING DIGITAL IMAGE PROCESSING METHODS Ph.D. Thesis - Karlsruhe Univ. [HOEHENLINIENGENERALISIERUNG MIT METHODEN DER DIGITALEN BILDVERARBEITUNG]
Gerhard Schweinfurth 1984 86 p refs In GERMAN
(Ser-C-291; ISBN-3-7696-9341-8; ISSN-0065-5325) Copyright. Avail: Issuing Activity

An operational method for contour line generalization exclusively based on digital image processing is presented. The programming system has a modular structure; single subroutines can be extended or exchanged. The method can simplify contour line images of a given starting scale for trailer cards of arbitrary scales. The method is composed of preprocessing, generalization, and scale adaptation. The generalization algorithm is simple and provides a preliminary result fully automatically. The verification on the screen makes it possible to interactively correct unsatisfactory parts of the generalized contour image. Tests of the generalization method show that it is operationally usable. Results are compared with those of manually generalized cards and are very satisfactory, even without interactive processing. Author (ESA)

N85-20689*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE STATION SOFTWARE ISSUES
Susan Voigt, ed. and Sharon Beskenis, ed. (Kentron International, Inc., Hampton, Va.) Washington Feb. 1985 68 p refs Workshop held in Hampton, Va., 20-21 Aug. 1984
(NASA-CP-2361; L-15945; NAS 1.55:2361) Avail: NTIS HC A04/MF A01 CSCL 09B

Issues in the development of software for the Space Station are discussed. Software acquisition and management, software development environment, standards, information system support for software developers, and a future software advisory board are addressed. For individual titles, see N85-20690 through N85-20695.

N85-20690*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOFTWARE MANAGEMENT ISSUES
In its Space Sta. of Software Issues Feb. 1985 p 6-16 (For primary document see N85-20689 11-61)
Avail: NTIS HC A04/MF A01 CSCL 09B

Issues related to the development of a software management plan are discussed with reference to contract requirements, NASA control, integration and testing, governmetn staffing, and the role of the Space Station Software Working Group. The major issues include software management planning, independent verification and validation, and quality assurance and configuration management. Essential considerations for each of these topics are outlined and recommendations are given. M.G.

N85-20691*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOFTWARE DEVELOPMENT ENVIRONMENT ISSUES
In its Space Sta. Software Issues Feb. 1985 p 16-23 (For primary document see N85-20689 11-61)
Avail: NTIS HC 04/MF A01 CSCL 09B

Issues related to the definition and provision of a standard environment for space station software development are examined. The benefits of a uniform, central NASA software development environment and the impact of such an environment on contractors

are adderessed. In addition, the control of environment maintainance and evolution over the 30 year lifetime is discussed. M.G.

N85-20692*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOFTWARE STANDARDS ISSUES
In its Space Sta. Software Issues Feb. 1985 p 24-37 (For primary document see N85-20689 11-61)
Avail: NTIS HC A04/MF A01 CSCL 09B

Standardization requirements for the space station software development project are discussed. Major issues include the need for common terminology, software technology selection and portability, languages, project directives, and documentation. Essential considerations for each of the topics is outlined and recommendations are given. M.G.

N85-20693*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INFORMATION SYSTEMS ISSUES
In its Space Sta. Software Issues Feb. 1985 p 37-40 (For primary document see N85-20689 11-61)
Avail: NTIS HC A04/MF A01 CSCL 09B

A Space Station Project-wide mechanism to document, control, and disseminate program design data required by subsystem implementation efforts is needed. In evaluation software requirements at the subsystem implementation level, each software effort should be required to develop and maintain a list and schedule of supporting data needs to be provided by other elements in the Space Station Project. A project-level scheme to coordinate and track these needs is essential to the success of these contributing subsystems. A project-wide information system should provide the response information via a computerized mechanism, providing a single controlled source for all such data. Such information may range in content from documentation to actual data base sets used directly as an input to the subsystem software. The Technical and Management Information System (TMIS), formerly known as the Management and Communication Data Systemn (MCDS), will be implemented by NASA to support its Space Station Program. M.G.

N85-20694*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHUTTLE SOFTWARE PRODUCTION FACILITY
In its Space Sta. Software Issues Feb. 1985 p 43-46 (For primary document see N85-20689 11-61)
Avail: NTIS HC A04/MF A01 CSCL 09B

Diagrams are presented which give an overview of the Shuttle Software Production Facility (SPF) management, the SPF hardware and software, and the software development process. The functions of the product software include simulation, analysis, operating system, mission reconfiguration, integration, data base, and program development M.G.

N85-20695*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOFTWARE TECHNOLOGY WITHIN NASA
In its Space Sta. Software Issues Feb. 1985 p 47-57 refs (For primary document see N85-20689 11-61)
Avail: NTIS HC A04/MF A01 CSCL 09B

NASA software technology is assessed in terms of a comparison of the state of practive (SOP) and the state of the art (SOA). The gap between SOP and SOA, the time lag for technology transfer, and the variance in practice of software technology are discussed. Issues regarding the impact of software technology on development cost/benefits are addressed. M.G.

N85-20696# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DIGITAL IMAGING PROCESSING [PROCESSAMENTO DIGITAL DE IMAGENS]
Nelson D. A. Mascarenhas and Flavio Roberto D. Velasco Oct. 1984 323 p refs In PORTUGUESE; ENGLISH summary
(INPE-3325-PRE/624) Avail: NTIS HC A14/MF A01

This test was prepared as a basis for a short course on digital image processing, offered at the School of Computation, IME-USP, Sao Paulo, covering the main topics of the area. Author

N85-20697# Sperry Systems Management, Huntsville, Ala.
BIT/BITE TRADEOFF ANALYSIS MODEL Final Report
E. Schwemmer, M. Baker, and G. Bailey 30 Sep. 1984 128 p
(Contract DAAK01-83-R-A267)
(AD-A149345) Avail: NTIS HC A07/MF A01 CSCL 14/2

This document is a discussion of the fundamental methodologies employed in the BIT/BITE TRADEOFF ANALYSIS MODEL. The model is designed to facilitate rapid evaluations of cost interactions and sensitivity to testability policies and associated test equipment. The primary objective is to develop a computer model that will assist the user in the selection of a cost-effective test policy for the life cycle of a proposed weapon system. The model is designed so that different approaches to sub-analysis can be selected on a data available basis to conduct tradeoff analyses between/among Built-In-Test, Built-In-Test Equipment, Automatic, Semi-Automatic, Manual Test Equipment and Sample Inspection Equipment that will test to levels necessary to support depot, intermediate rear, intermediate forward, and operational areas. The model is designed to highlight test methodology cost impact and compute the total life cycle costs of the system. GRA

N85-20698# Florida Univ., Gainesville. Dept. of Industrial and Systems Engineering.
A COMPUTER SYSTEM FOR GENERATING SINGLE AND DOUBLE SAMPLING PLANS FOR ATTRIBUTES DATA
K. W. Beitler and R. S. Leavenworth Aug. 1984 83 p
(Contract N00014-83-K-0093)
(AD-A149548; RR-84-35) Avail: NTIS HC A05/MF A01 CSCL 09/2

This study brings together the programs developed in three previous reports into a unified sampling system. One segment contains the single and double sampling plans of MIL-STD-105D along with subroutines that evaluate the normal, tightened and reduced plans including switching rules. Output includes system OC curves, and Average Sample Number (ASN), AOQ, and Average Fraction Inspected (AFI), curves in either graphical or tabular form. Another segment derives single and double sampling plans to satisfy two points designated on the OC curve. An algorithm is employed which seeks to minimize the ASN at a designated Acceptable Quality Level (AQL). The third segment is designed for use when rectifying inspection is employed. It derives single and double sampling plans based on one point on the OC curve, either the process average or a specified AQL value, intended to not exceed a specified Average Outgoing Quality Limit and minimizing the AFI at the process average or specified AQL. Programming is written in FORTRAN IV and development was on a VAX 11-750 computer. Author (GRA)

N85-20699# Oak Ridge National Lab., Tenn. Instrumentation and Controls Div.
COMPUTER-GENERATED DISPLAY SYSTEM GUIDELINES. VOLUME 1: DISPLAY DESIGN
P. R. Frey, W. H. Sides, Jr., R. M. Hunt (Search Technology, Inc., Norcross, Ga.), and W. B. Rouse (Search Technology, Inc., Norcross, Ga.) Sep. 1984 220 p refs
(Contract DE-AC05-84OR-21400; EPRI Proj. RP-2184)
(DE85-000679; EPRI-NP-3701-Vol-2) Avail: NTIS HC A10/MF A01

The method of communicating process information to the operator in a nuclear power plant control room is presently in a state of transition. The hardwired instruments currently in use are slowly being supplement and may eventually be replaced by information presented by computer-generated display systems. The primary objective is to provide guidance to utilities in the design of displays and the selection and retrofit of a computer-generated display system to the control room of an operating nuclear power plant. The information contained is closely linked to the process of retrofitting a computer-generated display system. Guidance is

offered regarding important human engineering considerations that should be addressed during the retrofit process. These human engineering considerations are linked to the hardware, software, and implementation decisions which must be made. DOE

N85-20700# California Univ., Livermore. Lawrence Livermore Lab.
CONSOLE I/O ROUTINES
W. J. Comfort, III 7 Sep. 1984 20 p
(Contract W-7405-eng-48)
(DE85-002644; UCID-30200-83-4) Avail: NTIS HC A02/MF A01

These console input-output routines are designed to provide the micro-CAE programmer with standard formats for micro-computer prompts, queries, and cues in the framework of user-friendly interaction. To that end, error checking and recovery were implemented wherever possible to lessen the chance of the user inadvertently introducing a catastrophic failure. The routines are written in Microsoft Basic (MBasic) and are intended to operate in a CP/M environment; modification will be required for other operating systems. The objective of these routines is to standardize the methods and presentation of user-computer interaction so that the user experiences a uniform and comfortable approach to (Micro-CAE programs. DOE

N85-20701# Argonne National Lab., Ill.
ADVANCED CONCEPTS IN SYSTEMS ANALYSIS AND SIMULATION
Greg Berry 1984 10 p refs Presented at the 3rd Intern. Conf. on Systems Engineering, Dayton, Ohio, 5 Sep. 1984
(Contract W-31-109-eng-38)
(DE85-002728; CONF-8409176-1) Avail: NTIS HC A02/MF A01

Analysis and simulation of advanced energy systems are best investigated using a comprehensive systems code. The concepts embodied in the SALT (Systems Analyses Language Translator) systems code are discussed. In particular, the concepts discussed are general system theory, preprocessing, precompilation of models, multidimensioned equation solving, optimization, dynamic systems and language translation. Some of the specific methods of implementation included in the above concepts are hierarchical decomposition, inverse calling, and polyalgorithmic optimization. DOE

N85-20702# Los Alamos Scientific Lab., N. Mex.
USER'S MANUAL FOR GRIZZLY
J. Abdallah, Jr. Sep. 1984 79 p refs
(Contract W-7405-eng-36)
(DE85-001405; LA-10244-M) Avail: NTIS HC A05/MF A01

The first release of GRIZZLY, a computer program to construct tables of atomic data for use in applications programs, is described. The first release of GRIZZLY has the capability to generate baseline equation-of-the-state tables for elements and mixtures using various physical models. GRIZZLY runs on the Los Alamos CRAY-1 computers. DOE

N85-20703# Los Alamos Scientific Lab., N. Mex.
PARALLEL PROCESSING EXPERIENCES ON THE DENELCOR HEP COMPUTER
A. H. Hayes 1984 14 p refs Presented at Intern. Workshop on Modelling and Performance Evaluation of Parallel Systems, Grenoble, France, 14 Dec. 1984
(Contract W-7405-eng-36)
(DE85-000653; LA-UR-84-3118; CONF-841242-2) Avail: NTIS HC A02/MF A01

Experiments conducted on a Denelcor HEP (heterogeneous element processor) computer are discussed. Algorithm research was done on four types of problems. (1) Monte Carlo, using GAMTAB, in which the interaction of photons with matter is analyzed; (2) hydrodynamics; (3) reactor safety, in which the operation of a nuclear reactor is simulated; and (4) particle-in-Cell, in which electrostatic interaction of plasma beams are studied. Means of maximizing programming efficiency are analyzed and ways of speed up processing are determined. DOE

N85-20704# Illinois Univ., Urbana. Dept. of Computer Science.
POLYLITH AND ENVIRONMENTS FOR MATHEMATICAL COMPUTATION
J. M. Purtilo May 1984 55 p refs
(Contract DE-AC02-76ER-02383)
(DE85-002967; UILU-ENG-84-1729; COO-2383-0098) Avail: NTIS HC A04/MF A01

A rough paradigm for mathematical problem solving is examined which is, a framework in which to develop requirements. Currently available tools and environments are discussed and how they do or do not support the problem solving paradigm is evaluated. A requirements analysis, first of logical tools proposed as components of the environment and second, of implementation tools necessary to bring about such an environment. a language is described in which instances of environments may be specified is well motivated. Likely examples of environments which could be constructed using the proposed tools are considered. DOE

N85-20705# Oak Ridge National Lab., Tenn.
MCNP CODE
S. N. Cramer 1984 29 p refs Presented at the Monte Carlo Methods in Nucl. Reactor Analysis, Ispra, Italy, 8 Oct. 1984
(Contract DE-AC05-84OR-21400)
(DE85-002565; CONF-8410170-1) Avail: NTIS HC A03/MF A01

The MCNP code is the major Monte Carlo coupled neutron-photon transport research tool at the Los Alamos National Laboratory. The present code is the direct descendent of the original Monte Carlo work of Fermi, von Neumaum, and Ulam at Los Alamos in the 1940s. Development has continued uninterrupted since that time, and the current version of MCNP (or its predecessors) has always included state-of-the-art methods in the Monte Carlo simulation of radiation transport, basic cross section data, geometry capability, variance reduction, and estimation procedures. The authors of the present code have oriented its development toward general user application. The documentation, though extensive, is presented in a clear and simple manner with many examples, illustrations, and sample problems. In addition to providing the desired results, the output listings give a wealth of detailed information (some optional) concerning each state of the calculation. The code system is continually updated to take advantage of advances in computer hardware and software, including interactive modes of operation, diagnostic interrupts and restarts, and a variety of graphical and video aids. DOE

N85-20706# California Univ., Berkeley.
LOOKING AT MULTIVARIATE DATA THROUGH FUZZY SETS
W. H. Benson Jul. 1984 13 p refs Presented at 1st Intern. Conf. on Fuzzy Inform. Processing, Kauai, Hawaii, 22 Jul. 1984
(DE85-000684; LBL-15792; CONF-8407100-1) Avail: NTIS HC A02/MF A01

There is usually a preliminary stage to data analysis, to become familiar with the data and provide a starting point for further analysis. An example from the recent literature illustrating the process of data inspection is reviewed and compared with a more direct approach based on fuzzy sets and computer graphics. A demonstratin is provided of the effectiveness and efficiency of direct expression of descriptions and viewpoints, and of direct manipulation of the graphic display. DOE

N85-20707# Selenia S.p.A., Rome (Italy).
A QUALITY CONTROL EXPERIMENT IN A REAL TIME MULTIPROCESSOR OPERATING SYSTEM: THE MARA 860 [UNA ESPERIENZA DI CONTROLLO QUALITA DI UN SISTEMA OPERATIVO REAL TIME MULTIPROCESSOR: MARA 860]
S. Finetti (Etnoteam S.P.A.) and G. Fraschetti 20 Feb. 1984 26 p refs In ITALIAN
Avail: NTIS HC A03/MF A01

The organization, instrumentation, and methodological aspects of software quality control system are described. A functional test and a load-stress stochastic quality control procedure were carried out in parallel. These approaches allow for the implementation of the tests without previous knowledge of the detailed structure of the system. The results are positive, since a

significant number of errors are detected. The possibility of using a monitor to start tests in a selective way, thus reducing the amount of personnel necessary, is mentioned. Author (ESA)

N85-20708# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
PARALLEL INPUT AND FEEDBACK IN DIALOGUE CELLS
P. J. W. tenHagen and J. Derksen (Netherlands Organization for Applied Scientific Research) Jul. 1984 19 p Submitted for publication
(CWI-CS-R8413; B8475626) Avail: NTIS HC A02/MF A01

A specification method for man-computer interaction, based on a programming concept called dialog cells is outlined. The method supports parallel input and separation of a dialog part from the algorithmic part of an application. Graphics interaction can be fully integrated. Problems associated with parsing parallel inputs are analyzed. Author (ESA)

N85-20709# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
VALIDATION SUMMARY REPORT (VSR), RYAN-MCFARLAND CORPORATION, AT AND T 385, RM/COBOL VERSION 2.0
13 Feb. 1985 61 p
(PB85-102093; OIT/FSTC-84/217) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Ryan-McFarland Corporation, RM/COBOL Version 2.0 running under the Unix Version 5.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20710# Federal Compiler Testing Center, Falls Church, Va.
BURROUGHS CORPORATION, BURROUGHS B3955 COBOL9 VERSION 6.8 Validation Summary Report
11 Sep. 1984 71 p
(PB85-103110; OIT/FSTC-84/325) Avail: NTIS HC A04/MF A01 CSCL 09B

The results obtained from the validation of the COBOL 9 version 6.8 compiler against the 1974 COBOL standard (X3.23-1974/FIPS PUB 21-1) are presented. The compiler was validated against the high level of FIPS PUB 21-1. An overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed are given. R.S.F.

N85-20711# Federal Compiler Testing Center, Falls Church, Va.
BURROUGHS CORPORATION, BURROUGHS B3955 FORT77 VERSION 6.8 Validation Summary Report
11 Sep. 1984 15 p refs
(PB85-110328; OIT/FSTC-84/326) Avail: NTIS HC A02/MF A01 CSCL 09B

The results obtained from the validation of the FORT 77 version 6.8 compiler against the 1978 FORTRAN standard (X3.9-1978/FIPS PUB 69) are summarized. The compiler was validated against the full level FORTRAN level of FIPS PUB 69. An overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed are included. R.S.F.

N85-20712# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS PLESSY MICRO SYSTEMS 68/50 COMPACT LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p
(PB85-108934; OIT/FSTC-84/512) Avail: NTIS HC A03/MF A01 CSCL 09B

The results obtained from the validation of the compact level II COBOL; V2.5 compiler against the 1974 COBOL standard (X3.23-1974/FIPS PUB 21-1) are presented. The compiler was validated against the high level of FIPS PUB 21-1. An overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed are included. R.S.F.

N85-20713# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS PLESSY MICRO SYSTEMS 68/50 HIGH PERFORMANCE LEVEL 2 COBOL; V2.5 Validation Sumaary Report
23 May 1984 47 p refs
(PB85-108942; OIT/FSTC-84/508) Avail: NTIS HC A03/MF A01 CSCL 09B

The results obtained from the validation of the high performance level II COBOL; V2.5 compiler against the 1974 COBOL standard (X3.23-1974/FIPS PUB 21-1) are summarized. The compiler was validated against the high level of FIPS PUB 21.1. An overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed are provided. R.S.F.

N85-20714# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS CIFER 2887 HIGH PERFORMANCE LEVEL 2 COBOL; V2.5 Validation Summay Report
23 May 1984 47 p refs
(PB85-108959; OIT/FSTC-84/507) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, High Performance Level II COBOL, V2.5 running under the Cifer Uniplus + UNIX System III release 2.0.S16, from Cifer provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found-if any. These include an overview of the validation which lists all categories of discrepancies by categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. R.S.F.

N85-20715# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS CIFER 2887 COMPACT LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p refs
(PB85-108967; OIT/FSTC-84/511) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, Compact Level II COBOL; V2.5 running under the Cifer Uniplus = UNIX System III release 2.0.S16, from Cifer provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/ FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author

N85-20716# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS IBM PERSONAL COMPUTER XT COMPACT LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p refs
(PB85-108918; OIT/FSTC-84/513) Avail: NTIS HC A03/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the Micro Focus,

Compact Level II COBOL; V2.5 running under the Digital Research Concurrent CP/M-86, version 3.1, from Digital Research provides a consolidated summary of the results obtained from the validation of the subject compiler was validated against the high level of FIP PUB 21-1. All the discrepancies found, if any are shown. These include an overview of the validation which lists all catagories of discrepancies by level/module within X3.23.1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20717# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS IBM PERSONAL COMPUTER XT HIGH PERFORMANCE LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p refs
(PB85-108926; OIT/FSTC-84/506) Avail: NTIS
HC A03/MF A01 CSCL 09B

Validation Summary Report (VSR) for the Micro Focus, High Performance Level II COBOL; V2.5 running under the Digital Research Concurrent CP/M-86, Version 3.1, from Digital Research provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21/1. All the discrepancies found, if any are given. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20718# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS FORTUNE 32:16 COMPACT LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p refs
(PB85-108884; OIT/FSTC-84/509) Avail: NTIS
HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, Compact Level II COBOL; V2.5 running under the Fortune FOR:PRO version 1.7, from Fortune Systems (enhanced version 7 UNIX) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20719# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS FORTUNE 32:16 HIGH PERFORMANCE LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p refs
(PB85-108892; OIT/FSTC-84/504) Avail: NTIS
HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, High Performance Level II COBOL; V2.5 running under the Fortune FOR:PRO version 1.7, from Fortune Systems (enhanced Version 7 Unix) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20720# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS IBM PERSONAL COMPUTER XT CIS COBOL; V4.5 Validation Summary Report
23 May 1984 34 p refs
(PB85-108868; OIT/FSTC-84/503) Avail: NTIS
HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, CIS COBOL; V4.5 running under the Digital Research Concurrent CP/M-86, Version 3.1, from Digital Research provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20721# Federal Compiler Testing Center, Falls Church, Va.
ICL, ICL 2988 COBOL C2COB. 1321 Validation Summary Report
Aug. 1984 49 p refs
(PB85-108876; OIT/FSTC-84/520) Avail: NTIS
HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the International Computers Ltd, COBOL C2COB.1321 running under the VME SV201 (Base 8.01) provides a consolidated summary of the results obtained from the validated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High - Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relalting the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20722# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS INTEL MICROPROCESSOR DEVELOPMENT SYSTEM MDS221 COMPACT LEVEL 2 COBOL; V2.5 Validation Summary Report
23 May 1984 47 p refs
(PB85-108900; OIT/FSTC-84/514) Avail: NTIS
HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Micro Focus, Compact level II COBOL; V2.5 running under the Digital Research CP/M, Version 2.2 (BIOS BY Micro Focus) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the federal levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20723# National Weather Service, Salt Lake City, Utah.
COMMUNICATIONS SOFTWARE FOR OLYMPICS MICROMATION COMPUTER SYSTEM
G. Sampson Jun. 1984 55 p refs
(PB85-109510; NOAA-NWS-WRCP-44) Avail: NTIS
HC A04/MF A01 CSCL 09B

The synchronous passive tap is designed to provide a means for obtaining data from the AFOS communications network, while inducing no impact or degradation to the network. This design allows a complete AFOS data set to be transferred to another computer system, or maintained within itself to establish a usable database. All software was developed on a micromation m/system and is not transferable to any other computers system other than the micromation mi system. This limitation is caused by strict hardware requirements and timing relationships inherent in all

sophisticated communication software. The current version of software was designed to interface with a data base program written for the western region 1984 Olympic project. An AFOS system was created to provide a backup for the Olympics and allow meteorological data to be accessed directly by visiting team meteorologists. B.G.

N85-20724# National Weather Service, Salt Lake City, Utah.
STANDARDIZED FORMAT FOR COMPUTER SERIES
Jan. 1984 19 p refs
(PB85-109668; NOAA-NWS-WRCP-1) Avail: NTIS HC A02/MF A01 CSCL 09B

Characteristics, requirements, and instructions for setting up the computer program and data files are listed. B.G.

N85-20725# Federal Compiler Testing Center, Falls Church, Va.
MICRO FOCUS IBM PERSONAL COMPUTER XT, HIGH PERFORMANCE LEVEL, 2 COBOL, IBM PC TAILORED; V2.6 Validation Summary Report
23 May 1984 35 p refs
(PB85-110815; OIT/FSTC-84/501) Avail: NTIS HC A03/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the Micro focus, High Performance, Level II COBOL, IBM PC Tailored; V2.6 running under the IBM Personal Computer DOS provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. All the discrepancies found-if any are listed. These include an overview of the vilidation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N85-20726# Environmental Protection Agency, Las Vegas, Nev. Environmental Monitoring Systems Lab.
USER'S GUIDE FOR THE COMPUTER PROGRAM RESPONSE FACTOR (REFAC) Progress Report, Jul. 1983 - Sep. 1984
Mary C. Bates and Glinn G. Hansen Nov. 1984 43 p refs
(PB85-138600; EPA/600-8-84-028) Avail: NTIS HC A03/MF A01 CSCL 13B

This manual describes REFAC to the user and demonstrates how to run the program. A description of the INITIALIZATION and ONGOING process is given along with the formulas used to calculate relevant statistics. The running of REFAC is described, a command list is provided, and examples of REFAC generated output for both ONGOING and INITIALIZATION processes are also given. REFAC variables and data structures are presented along with the source listing. GRA

N85-20187# Joint Publications Research Service, Arlington, Va.
ESOP EXPERT SYSTEM MODEL DESCRIBED
Pierre Jouvelot and Daniel LeConte desFloris *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 38-44 ref Transl. into ENGLISH from Minis et Micros (Paris), 8 Oct. 1984 p 91-94 (For primary document see N85-20183 11-31)
Avail: NTIS HC A055/MF A01

N85-20015# Joint Publications Research Service, Arlington, Va.
FRENCH WORK TOWARD FLEXIBLE SOFTWARE WORKSHOPS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 32-37 Transl. into ENGLISH from Le Nouvel Autom. (Paris), Oct. 1984 p 22-25 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

N85-20188# Joint Publications Research Service, Arlington, Va.
CAD/CAM SYSTEMS FOR PRINTED CIRCUIT DESIGN, MANUFACTURE
Catherine Gross *In* is West Europe Rept.: Sci. and Technol. (JPRS-WST-85-006) 11 Feb. 1985 p 51-54 Transl. into ENGLISH from Electron. Ind. (Paris), 15 Oct. 1984 p 43-45 (For primary document see N85-20183 11-31)
Avail: NTIS HC A05/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N85-20727*# Kentron International, Inc., Hampton, Va. Aerospace Technologies Div.
PASLIB PROGRAMMER'S GUIDE FOR THE INFINITE ELEMENT MACHINE, REVISION 2.1-A
Thomas W. Crockett Apr. 1984 156 p refs
(Contract NAS1-16000)
(NASA-CR-172281; NAS 1.26:172281) Avail: NTIS HC A08/MF A01 CSCL 09B

PASLIB is a library of Pascal callable subroutines designed to give application programs access to the unique architectural features of the Finite Element Machine and to the software support services provided by the Nodal Exec operating system which runs on it. The PASLIB subroutines are documented and the procedures needed to write Pascal programs for execution on the Finite Element Machine are defined. Considerations for obtaining optimum hardware and software performance are given. A brief overview of debugging and performance analysis capabilities available to the programmer is presented. B.W.

N85-20728# Argonne National Lab., Ill.
PERSONAL DESKTOP COMPUTING IN A RESEARCH AND DEVELOPMENT LABORATORY
J. Schofield 1984 14 p refs Presented at Natl. Inst. for Manage. Res. Conf. on Personal Computers in Business, Chicago, 14 Nov. 1984
(Contract W-31-105-eng-38)
(DE85-002765; CONF-8411115-1) Avail: NTIS HC A02/MF A01

The computing environment at Argonne National Laboratory is described as well as the management and technical actions underway to integrate personal desktop computers into a coherent hierarchy of computing systems connected through a heterogeneous file transfer network. The arrival of personal desktop computers is considered both inevitable and beneficial, and policies are being pursued to ensure that they are compatible with and complementary to the rest of the Laboratory's computing resources. Given the decentralized management of the Laboratory, the central Computing services organization has relied almost exclusively on incentives, rather than controls, to channel the growth of personal desktop computers. These actions actually strengthened the role of Computing Services in the laboratory and provided experience through which additional ways of serving and guiding computer users was learned. DOE

N85-20210# Joint Publications Research Service, Arlington, Va.
GUIDEPOST ROUTING ALGORITHM FOR DISTRIBUTED COMPUTER NETWORKS
Zhongxiu Sun, Du Zhang, and Peigen Yang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 71-77 refs Transl. into ENGLISH from Dianzi Xuebao (China), no. 1, Jan. 1984 p 35-39 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

No abstracts in this category.

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-20729*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EIGENVALUES OF THE PSEUDOSPECTRAL FOURIER APPROXIMATION TO THE OPERATOR SIN (2x) d/dx Final Report
Hillel Tal-Ezer (Tel-Aviv Univ.) Feb. 1985 12 p refs
(Contract NAS1-17070)
(NASA-CR-172538; NAS 1.26:172538; ICASE-85-8) Avail: NTIS HC A02/MF A01 CSCL 12A

It is shown that the eigenvalues Z sub i of the pseudospectral Fourier approximation to the operator sin(2x) curly d/curly dx satisfy (R sub e) (Z sub i) = + or - 1 or (R sub e)(Z sub I) = 0. Whereas this does not prove stability for the Fourier method, applied to the hyperbolic equation U sub t = sin (2x)(U sub x) - pi < x < pi; it indicates that the growth in time of the numerical solution is essentially the same as that of the solution to the differential equation. R.S.F.

N85-20730*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL METHODS IN TIME FOR PARABOLIC PROBLEMS Final Report
Hillel Tal-Ezer (Tel-Aviv Univ.) Feb. 1985 21 p refs
(Contract NAS1-17070)
(NASA-CR-172539; ICASE-85-9; NAS 1.26:172539) Avail: NTIS HC A02/MF A01 CSCL 12A

A pseudospectral explicit scheme for solving linear, periodic, parabolic problems is described which has infinite accuracy both in time and in space. The high accuracy is achieved while the time resolution parameter M (=) (1/delta t) for time marching algorithm) and the space resolution parameter N B = O(1/detla x) have to satisfy M = O(N sup/+epsilon) epsilon > O, compared to the common stability condition M = O(N sup 2) which has to be satisfied in any explicit finite order time algorithm. Author

N85-20731*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPLEX SYMMETRIC MATRICES WITH STRONGLY STABLE ITERATES Final Report
Eitan Tadmor Feb. 1985 24 p refs
(Contract NAS1-17070)
(NASA-CR-172542; ICASE-85-10; NAS 1.26:172542) Avail: NTIS HC A02/MF A01 CSCL 12A

Complex-valued symmetric matrices are studied. A simple expression for the spectral norm of such matrices is obtained, by utilizing a unitarily congruent invariant form. A sharp criterion is provided for identifying those symmetric matrices whose spectral norm is not exceeding one: such strongly stable matrices are usually sought in connection with convergent difference approximations to partial differential equations. As an example, the derived criterion is applied to conclude the strong stability of a Lax-Wendroff scheme. Author

N85-20732# Tel-Aviv Univ. (Israel). Dept. of Physics.
SUPERMANIFOLDS AND BEREZIN'S NEW INTEGRAL
Y. Neeman (Texas Univ., Austin) 1984 13 p refs Presented at the 12th Intern. Conf. on Differential Geometric Methods in Theoretical Physics, Clausthal (West Germany), 1983
(Contract DE-AS05-76ER-03992)
(DE85-001833; DOE/ER-03992/565) Avail: NTIS HC A02/MF A01

Berezin's new integral over a supermanifold is introduced and some of its applications are discussed. Generalized superdifferential exterior forms are outlined. The application of the concept of complementary forms to the integratin over a sub-supermanifold is discussed. Commutative differentials are treated as plain commuting variables. The necessary definitions for a scalar product, possibly hermitian, are given. Characteristic classes are discussed. DOE

N85-20733# Princeton Univ., N. J. Dept. of Statistics.
CHECKING THE SHAPE OF DISCRETE DISTRIBUTIONS
D. C. Hoaglin and J. W. Tukey Aug. 1984 140 p refs
(Contract DE-AC02-81ER-10841)
(DE85-000177; DOE/ER-10841/11; TR-275) Avail: NTIS HC A07/MF A01

Techniques for examining or testing the distributional behavior of a sample of continuous data have received much attention in the statistical literature. Most commonly the question is whether the data depart seriously from a Gaussian distribution, either systematically or by having a few anomalous observations. At times other families of distributions, such as the exponential or the Weibull, serve as the standard of comparison. Rather than summarize a possibly complex pattern of behavior in a single number, more is learned from graphical displays, as in a normal probability plot. In a similar vein graphical techniques help to appreciate how closely a sample of discrete data follows a member of one of the common families of discrete distributions, such as the binomial or the Poisson. Simple graphical techniques that incorporate resistance - so as to isolate unusual portions of the data and prevent them from distorting the overall picture are emphasized here. DOE

N85-20734# California Univ., Livermore. Lawrence Livermore Lab.
SOLVING PARTIAL DIFFERENTIAL EQUATIONS ON MULTIPROCESSORS
Garry Rodrigue Sep. 1984 18 p refs Presented at the Intern. Workshop on Modelling and Performance Evaluation of Parallel Systems, Grenoble, France, 14-26 Dec. 1984
(Contract W-7405-eng-48)
(DE85-000745; UCRL-91570; CONF-841242-1) Avail: NTIS HC A02/MF A01

Multiprocessors can be characterized by two attributes: first, a multiprocessor is a single computer that includes multiple processors and, second, processors may communicate and cooperate at different levels in solving a given problem. A multiprocessing system is considered which is controlled by one operating system that provides interaction between computer modules (a computer module is defined as a processor, local memory, and I/O interfaces). DOE

N85-20735# California Univ., Livermore. Lawrence Livermore Lab.
THREE ALGORITHMS FOR PARAMETRIC FREQUENCY DOMAIN SYSTEM IDENTIFICATION
D. M. Tilly Nov. 1984 35 p refs
(Contract W-7405-eng-48)
(DE85-002801; UCIDF-20255) Avail: NTIS HC A03/MF A01

System identification problems can be solved by using one of the many time domain methods that were studied and well developed in the last 15 years. However, in practice, frequency response data, or Bode plots, may be the only data available to the engineer. Also, in some applications a time domain model of the system is not necessary. Instead, the engineer wishes to gain a general knowledge of system response. A frequency domain system identification technique is more appropriate. The coefficients of a Laplace transform transfer function system model were as estimated. The transfer function model aids in the design of machine tool control systems. Several available parametric frequency domain identification methods are studied and three computer codes are chosen for further development as representatives of different approaches to the solution of the problem. DOE

N85-20736# Los Alamos Scientific Lab., N. Mex.
USING SEMIGROUPS AND THE TROTTER PRODUCT FORMULA TO SOLVE QUASI-LINEAR SYSTEMS
G. H. Pimbley 1984 22 p refs Presented at Am. Math. Soc./SIAM Meeting, Santa Fe, N. Mex., 23 Jul. 1984
(Contract W-7405-eng-36)

(DE85-002041; LA-UR-84-2937; CONF-8407103-1) Avail: NTIS HC A02/MF A01

A quasi-linear system with linear coupling terms is treated. An approximate system for which the Trotter product of constituent semigroups converges is solved. Then it is shown that the approximate solutions converge to a solution of the original system, and that the resulting solution operator is a semigroup. Remarks are made about a nonlinearly coupled system. DOE

N85-20737# California Univ., Berkeley. Lawrence Berkeley Lab.
GEOMETRIC HAMILTONIAN STRUCTURES AND PERTURBATION THEORY
Aug. 1984 31 p refs Presented at the NRL-NSWC Workshop on Local and Global Methods of Dyn., Silver Spring, Md., 23 Jul. 1984
(Contract DE-AC03-76SF-00098)
(DE85-002005; LBL-18302; CONF-840794-1) Avail: NTIS HC A03/MF A01

The Hamiltonian structure of the various perturbation theories used in practice is examined. The geometry of a Hamiltonian structure for non-singular perturbation theory applied to Hamiltonian systems on symplectic manifolds investigated the connection with singular perturbation techniques based on the method of averaging is discussed. DOE

N85-20738# Brookhaven National Lab., Upton, N. Y.
SEQUENTIAL MINIMIZATION FOR SUM OF SQUARES OF UNKNOWN FUNCTIONS
S. C. Kao 13 Aug. 1984 13 p Presented at Ann. Meeting of the Am. Statist. Assoc. (ASA), Philadelphia, 12 Aug. 1984
(Contract DE-AC02-76CH-00016)
(DE85-004162; ENL-35351; CONF-840849-8) Avail: NTIS HC A02/MF A01

The need to find an optimal point in a given domain such that the optimal point minimizes an objective function which is in the form as a sum of squares of unknown functions is outlined. It is assumed that the objective function is denoted by F(chi), where chi = (chi sub 1, chi sub 2,...- chi sub n) sup T, with T being the symbol indicating the transpose of a vector or a matrix. Then F(x) is the sum of squares of functions F(sub i)(x), i =1,2,...,m. Each function f(sub i)(x) actually represents a special characteristic. The analytical expression of f(sub i)(x) is not known, and its value is normally numerically calculated. The goal is to find chi=chi sub 0 such that F (chi sub 0) attains the minimum of F(chi) for chi in a predetermined domain D. A sequential scheme is presented with some numerical tests provided to illustrate the feasibility of the sequential scheme. To find each f(sub i)(x) value for given x is very costly in actual cases. The goodness criteria for a scheme is to have the number of the sequentially selected points as less than possible under the condition that the end point of the sequence is within certain accuracy limit to chi0. DOE

N85-20739# Princeton Univ., N. J. Dept. of Statistics.
SCRAWL PLOTS, AND LETTER AND BLETTER STRIPS
J. G. Veitch Jun. 1984 29 p refs
(Contract DE-AC02-81ER-10841)
(DE85-001409; DOE/ER-10841/14) Avail: NTIS HC A03/MF A01

Data from a bivariate distribution are often graphically presented by using a scatter plot. Adding a suitable depiction of the marginal data distributions to the edges of the scatter plot allows interesting features of the marginal data distributions to be seen alongside the original bivariate data. Marginal data depictions by a modification of quantile-quantile plots (QQ plots) called scrawl plots are proposed and a strip of axis showing location of the letter values, or the broadened letter values are added. Since scrawl plots are modified QQ plots they inherit useful features of QQ plots these include information about the shape of the marginal distribution, the presence and type of skewness, the presence of heavy tails, gaps and ties in the ordered data, appearances of bimodality or high shoulders, and assmumptions of normality. This type of information is often either absent or depicted poorly, both in univariate competitors to the QQ plot and in the basic scatter plot. DOE

N85-20740# Texas Univ., Austin. Inst. for Fusion Studies.
ALGEBRAIC DECAY IN SELF-SIMILAR MARKOV CHAINS
J. D. Hanson, J. R. Cary, and J. D. Meiss Oct. 1984 34 p refs
(Contract DE-FG06-80ET-53088)
(DE85-003162; DOE/ET-53088/156) Avail: NTIS HC A03/MF A01

A continuous time Markov chain is used to model motion in the neighborhood of a critical noble invariant circle in an area-preserving map. States in the infinite chain represent successive rational approximants to the frequency of the invariant circle. The nonlinear integral equation for the first passage time distribution is solved exactly. The asymptotic distribution is a power law times a function periodic in the logarithm of the time. For parameters relavant to Hamiltonian systems the decay proceeds as 1/T (sup 4.05). DOE

N85-20741# Sandia Labs., Albuquerque, N. Mex.
SOLUTION OF STRUCTURED NON-STIFF ODES
L. F. Shampine Nov. 1984 20 p refs
(Contract DE-AC04-76DP-00789)
(DE85-004137; SAND-84-2189) Avail: NTIS HC A02/MF A01

The solution of the initial value problem for a system of ordinary differential equations (ODEs), $y' = f(x,y)$, by Runge-Kutta methods was considered. The structure is that a large portion of the cost of evaluating (x,y) arises in the evaluation of functions of the independent variable x only. It is shown that when the structure is favorable, there are methods which are considerably more efficient than those currently used in general purpose codes. DOE

N85-20742# Sandia Labs., Albuquerque, N. Mex.
NEW APPROACH FOR SOLVING LARGE RESIDUAL NONLINEAR LEAST SQUARES PROBLEMS
D. E. Salane Sep. 1984 33 p refs
(Contract DE-AC04-76DP-00789)
(DE85-002555; SAND-84-1564) Avail: NTIS HC A03/MF A01

The solution of the nonlinear least squares problem is examined. A continuation method is used to develop a new framework for the model thrust region approach for solving nonlinear least squares problems. This framework gives a motivation for the direct selection of the trust region parameter. It also provides a natural safeguard for trust region methods which leads to a very robust algorithm. A class of algorithms based on the continuation method is presented and, the implementation details for one member of the new class is examined. The convergence and descent properties of this algorithm are discussed. Numerical evidence is given which shows that the new algorithms are competitive with existing model trust region algorithms. For large residual problems or problems in which a good initial starting guess is not available, the performance of the new algorithm is very promising. DOE

N85-20743# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
STABILITY RESULTS FOR DISCRETE VOLTERRA EQUATIONS: NUMERICAL EXPERIMENTS
P. J. vanderHouwen and J. G. Blom Jul. 1984 15 p refs Submitted for publication
(CWI-NM-R8409; B8475635) Avail: NTIS HC A02/MF A01

A local stability criterion for linear multistep discretizations of first and second kind Volterra integral equations with finitely decomposable kernel is formulated and is tested in numerical experiments. No examples which behaved unstably when the criterion predicted stability are found. However, examples which behaved stably when the criterion predicted instability are found. A possible explanation may be the fact that the stability criterion is independent of the decomposition of the kernel, that is, it holds for the most ill-conditioned decomposition and consequently it may be rather pessimistic. Author (ESA)

N85-20744# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
OBJECT-ORIENTED ALGEBRAIC SPECIFICATION: PROPOSAL FOR A NOTATION AND 12 EXAMPLES
J. A. Bergstra, J. Heering, and J. W. Klop Jun. 1984 28 p refs Submitted for publication
(CWI-CS-R8411; B8475627) Avail: NTIS HC A03/MF A01

A notation for expressing the dynamic behavior of configurations of objects is introduced. At each instant a configuration is just a multiset of objects which themselves are points (values) from an algebraically specified abstract data type. Examples of the expressive power of notation are given. Author (ESA)

N85-20673# Grenoble-1 Univ. (France).
CLASSIC FOURIER MICRODISTRIBUTIONS IN THE REAL ANALYTIC CASE [MICRODISTRIBUTIONS DE FOURIER CLASSIQUES DANS LE CADRE ANALYTIQUE REEL]
Andre Piriou *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 109-134 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20674# Grenoble-1 Univ. (France).
A CONTINUOUS HELSON SURFACE IN R3
Detlef Mueller *In its* Ann. of the Fourier Inst., Vol. 34 No. 4 1984 p 135-150 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20675# Grenoble-1 Univ. (France).
GENERALIZATION OF BEURLING ALGEBRAS [GENERALISATION DES ALGEBRES DE BEURLING]
Phillipe Tchamitchian *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 151-168 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20676# Grenoble-1 Univ. (France).
FINITE PRODUCTS OF COMMUTATORS IN C* ALGEBRAS [PRODUITS FINIS DE COMMUTATEURS DANS LES C* ALGEBRES]
P. delaHarpe and G. Skandalis *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 169-202 refs IN FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-20745 Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
STOCHASTIC RUNAWAY OF DYNAMICAL SYSTEMS
D. Pfirsch and P. Graeff Oct. 1984 32 p refs
(IPP-6/244) Copyright. Avail: Issuing Activity

An H-theorem for n-dimensional, incompressible, dynamical systems driven by external stationary stochastic forces is derived, and sufficient and necessary criteria for the asymptotic divergence of entropy (runaway) are obtained. These criteria are sufficient for the divergence of moments. The stochastic forces considered are mappings of general Ornstein-Uhlenbeck processes as a continuous example and of telegraph processes as a discrete one. Extension to more general stationary Markovian processes should be possible. The assumed incompressibility is unavoidable with the present method of using an H-theorem. Nonlinear transformation of a compressible system into an incompressible one, as, for instance, in the case of wave propagation in a random medium is possible. Another way to generate incompressibility is to add an auxiliary dimension, which allows conclusions to be drawn for a semimonotonically shrinking flow. Author (ESA)

N85-20746# Illinois Inst. of Tech., Chicago. School of Management and Finance.
AN EXACT SOLUTION TO THE 2 POINT OC (OPERATING-CHARACTERISTIC) CURVE DETERMINATION Research Report
J. E. Hall, T. W. Knowles, and M. Z. Hassan Nov. 1983 18 p
(Contract N00014-82-K-0560)
(AD-A148120) Avail: NTIS HC A02/MF A01 CSCL 12/1

The determination of an operating-characteristic (OC) curve which passes through two arbitrarily selected points is a well known problem in statistical quality control. Ordinarily this problem cannot be solved exactly as the solution sampling plan must be defined by a non-negative integer couple (n,c). In this paper a randomization process is defined for the acceptance and rejection of all lots. Within this randomization process the two point OC definition problem is cast as a linear program. Employing the traditional solution and the LP solution, a procedure is devised for an exact solution to the problem. Author (GRA)

N85-20747# Naval Ocean Systems Center, San Diego, Calif.
STATISTICAL ANALYSIS OF AUTOREGRESSIVE SPECTRAL ESTIMATES FOR NOISE CORRUPTED AUTOREGRESSIVE SERIES Technical Report, May 1983 - Jan. 1984
D. F. Gingras Oct. 1984 30 p
(AD-A149543; NOSC/TR-979) Avail: NTIS HC A03/MF A01 CSCL 12/1

Estimation of the spectral density function for a Gaussian distributed autoregressive series from observations of a noise corrupted version is considered when the order of the autoregressive series is assumed to be known. When the high-order Yule-Walker equation estimates of the autoregressive parameters are used to form the spectral density estimate, it is shown that the estimate is weakly consistent and asymptotically normal with zero mean and finite variance. A closed form expression for the asymptotic variance is developed and the expression is analyzed for the first-order AR series case. Author (GRA)

N85-20748# Brookhaven National Lab., Upton, N. Y.
SIMULATION OF ESTIMATING PERIODICITY OF SEASONALLY STATIONARY TIME SERIES
Ç. J. Tian Jun. 1984 30 p refs Presented at the Intern. Conf. on Energy Modelling and Simulation, Minneapolis, 13 Aug. 1984
(Contract DE-AC02-76CH-00016)
(DE85-003517; BNL-35384; CONF-840855-1) Avail: NTIS HC A03/MF A01

Some common periodicity estimation methods, the periodogram analysis, the maximum entropy spectral method, the successive average method as well as the graphic method, are considered. For comparing these methods and verifying their practical efficiency, simulations are performed on several groups of sonal stationary time series which are generated by the model x(t) - v(t) + z(t); v(t) being a seasonal component with different forms (sinusoid, unequal amptitude oscillation, slope signal, exponential decay signal and block signal etc.) and z(t) being autoregressive process under different levels of signal-noise ratio. Computational results comprehensively illustrate that the succssive average method is easier to carry out and more efficient in practice. DOE

N85-20749# California Univ., Livermore. Lawrence Livermore Lab.
BAYESIAN ANALYSIS OF TIME SERIES 1: HOUSEHOLDER TRANSFORMATION ANALYSES
W. Gersch Nov. 1984 53 p refs
(Contract W-7405-eng-48)
(DE85-004449; UCID-20271) Avail: NTIS HC A04/MF A01

A smoothness priors-Bayesian analysis method for the analysis of stationary and nonstationary time series is shown. The method is applied to the estimation of the mean value function of a nonstationary time series, the estimation of the impulse response from not necessarily stationary data, the estimation of the power spectral density from a short duration time series and the estimation of the transfer function between input and output data, for short

segments of stationary time series. Each problem is cast as an ordinary least squares problem with particular stochastic constraints. The stochastic constraints have an interpretation as a prior distribution on the unknown model parameters. The critical computation of the likelihood of the Bayesian model is done using a Householder transformation least squares algorithm. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-20750# Carnegie-Mellon Univ., Pittsburgh, Pa. Graduate School of Industrial Administration.
NEEDS, OPPORTUNITIES, AND OPTIONS FOR LARGE SCALE SYSTEMS RESEARCH
G. L. Thompson Oct. 1984 65 p
(Contract DE-AC01-84ER-30059)
(DE85-002664; DOE/ER-30059/T1) Avail: NTIS HC A04/MF A01

The primary purpose of the 1984 Conference on Large Scale Systems Research was to determine several high-risk, long-range research areas which, if successfully pursued, would have significant impact on the design and operation of future systems and the redesign and operation of current systems. One of the things that became evident in the conference was that the arbitrary division of the study of systems into separate parts such as, system modelling, mathematical solution, computer solution, and managerial implementation is not necessarily productive because each part has a significant interaction with each other part. The principal recommendations of the panel members are listed with justifications and estimates of time needed and costs. An analysis of the questionnaire responses received from 20 respondees is given. Background information is provided which will help in the understanding of the recommendation. DOE

N85-20751# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SPACE SYSTEM APPLICATIONS TO TACTICAL OPERATIONS
Loughton, England Oct. 1984 181 p refs In ENGLISH and FRENCH Symp. held in Hampton, Va., 17-21 Oct. 1984
(AGARD-CP-344; ISBN-92-835-0357-0) Avail: NTIS HC A09/MF A01

The attribute of space communication, navigation, and remote sensing systems which contribute to the effectiveness of tactical military operations are characterized and assessed. The interaction of space assets with ground and mobile resources are investigated as well as consequence operational issues. Future trends in space technology and their relationship to evolving combat needs are examined. For individual titles, see N85-20752 through N85-20779.

N85-20752# Tactical Air Command, Langley AFB, Va.
TACTICAL OPERATIONS AND SPACE APPLICATIONS
T. L. Craig *In* AGARD Space System Applications to Tactical Operations Oct. 1984 3 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

There are obvious benefits to be gained by tactical air forces from the use of the space frontier (not necessarily manned space forces). Increases in capabilities to communicate; observe global weather; support search and rescue; maintain surveillance; navigate precisely; and develop other technology is impressive. These space-related capabilities must be integrated with air, ground, and sea capabilities so that armed forces can interoperate effectively. Efforts to address the Soviet space-based threat using the ASAT missile, and the contributions of the NAVSATR GPS, VHSIC, on-board computers, and satellite communications are reviewed. A.R.H.

N85-20753# Air Force Space Div., Los Angeles, Calif.
US MILSATCOM: PRESENT AND FUTURE
R. H. Gibson *In* AGARD Space System Applications to Tactical Operations Oct. 1984 8 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The communications requirements of tactical users of U.S. Military Satellite Communications (MILSATCOM) systems are discussed, and present MILSATCOM sytstems are described. In recognition of known threats to satellite communications systems, the deficiencies in tactical military satellite communications are outlined. Then developing and planned MILSATCOM systems and the benefits of increased survivability expected to be achieved by interoperability and internetting are disucssed. Evolving technologies, especially in the new communications band extremely high frequency (EHF), and their potential payoffs are also considered. A.R.H.

N85-20754# Defense Communications Agency, Washington, D.C.
INTEGRATED SUPPORT OF TACTICAL OPERATIONS BY SATELLITE COMMUNICATIONS
William P. McKee, Jr. *In* AGARD Space System Applications to Tactical Operations Oct. 1984 6 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

One of 14 key features of the architecture of worldwide digital system architecture (WWDSA) for the U.S. Department of Defense is the expanded and integrated use of satellite communications in the support of both strategic and tactical defense missions. Under the WWDSA concept, satellite connectivity will be available on an as needed and near instantaneous basis through the use of demand assignment multiple access without overtaxing satellite capacity. Satellite communications will complement the other means of connectivity; and, in some cases be used only when no other means of suitable connectivity are available as for restoral of damaged terrestrial links or for provision of temporary video circuits. A large number of small satellite Earth terminals, with an effective integrated satellite/terrestrial transmission control system, would allow satellite communications to be truly integrated with other communications media to provide increased survivability and more effective support of tactical, strategic and defense-wide operations. How WWDSA Feature L may provide integrated satellite communications support of tactical operation is considered. A.R.H.

N85-20755# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EHF MILSATCOM SYSTEMS FOR TACTICAL USERS Abstract Only
D. R. McElroy *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p Sponsored by AF (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

Certain types of satellite communications (SATCOM) systems can provide features required for tactical operations. One approach involves the use of the wide bandwidth allocations in the EHF band (i.e., 30-to-50 GHz) to provide systems with larger capacities and to permit the use of robust spread spectrum modulation techniques. Evolution into these higher frequencies also offers the opportunity to incorporate signaling structures which are functionally common across multiple user communities. Such techniques provide interoperability possibilities while allowing more efficient use of spacecraft assets and minimizing the number of unique terminal developments. Furthermore, the concept departs from traditional SATCOM designs by incorporating increased satellite sophistication for reduced terminal size and complexity requirements. The associated spacecraft would employ advanced technologies such as uplink antenna discrimination, on-board signal processing, and downlink beamhopping. Several system configurations for providing EHF service to tactical users are presented, the advantage of the advanced technologies incorporated are discussed, and some spacecraft implementation possibilities are indicated. A.R.H.

N85-20756# National Defence Headquarters, Ottawa (Ontario).
TACTICAL MILITARY COMMUNICATIONS BY SATELLITE RELAY AT HIGH LATITUDES

John Collins, E. Deslauriers, L. Matheson, and J. Ohrt *In* AGARD Space System Applications to Tactical Operations Oct. 1984 15 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The trend in military satellite communication for tactical purposes is towards the EHF spectrum. For currently practical power aperture levels geostationary EHF satellite communications are not considered likely to be militarily reliable for a country such as Canada. This is due to high path losses at latitudes common to Canadian operations. The use of inclined orbits to solve this problem is examined. Elliptic synchronous and semi-synchronous and low circular orbits are examined in terms of operating and tracking requirements, including rages and Doppler effects at the user terminal. It is concluded that a highly elliptic inclined semi-synchronous orbit possesses significant advantages for EHF tactical communications at latitudes common to military operations in Canada. A.R.H.

N85-20757# Signals Research and Development Establishment, Christchurch (England). Satellite Communications Centre.
UK SKYNET 4 COMMUNICATIONS SATELLITES Abstract Only
T. C. Tozer and P. H. Masterman *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The UK Skynet 4 Satellites, which will provide enhanced tactical and strategic communications facilities for the British forces, is based upon the proven ECS vehicle and employs 3-axis stabilization in geostationary orbit. The total power consumption of about 1.2 kw is derived from solar panels and the on-station mass is about 660 kg. At a position of 1 w, the first satellite will be visible from Europe, the East coast of America and the Middle East. Satellite contains four wideband transparent transponders designed to handle a large number and variety of users. A number of reconfigurable antenna options may be selected, including Earth, NATO, European, and Central European cover. Another notable feature is the adaptive nulling antenna; this may be controlled by telecommand to mitigate the effect of uplink jamming. The processing channel employs a spread-spectrum uplink which is despread on the satellite to give both secure broadcast and telecommand. This self-contained receiver represents a significant achievement in on-board processing. An experimental 44 GHz receiver is incorporated with a downlink at SHF to be used for R&D purposes and to asses the potential of EHF. Some of the satellite features with their rationale are highlighted, and some likely future directions are indicated. A.R.H.

N85-20758# Admiralty Surface Weapons Establishment, Portsdown (England).
MINIMIZATION OF SYSTEM VULNERABILITY IN NAVAL SATELLITE COMMUNICATION NETWORKS Abstract Only
C. J. Madams *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The advent of the microprocessor readily enabled the modern implementation of complex modulations and simplified the control of communication networks and encouraged a fresh examination o the architecture employed in the United Kingdom's Naval SHF satellite communications. The principle of the present SATCOM organization, including threat scenarios are discussed. Models are developed that are both compatible with current operational practice and future requirements. The concept of system distribution is then applied, the path of a signal being traced from operational origin to destination. The vulnerability of each path node is discussed and countermeasures which include alternate modes that minimize weakness are described. Such a treatment leads to an enhanced traffic capacity and realizes a system which is readily expanded to meet changing/increased requirements. It also impinges on build standard criteria and can lead to a more economic solution than currently practiced. Author

N85-20759# Ferranti Electronics Ltd., Poynton (England).
THE FERRANTI TACTICAL SHF SATCOM STATION (MANSAT) Abstract Only
I. L. Westall and A. S. McK.Anderson *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The Communications Group of the Royal Signals and Radar Establishment (RSRE) Malvern, England, pioneered development of small tactical SHF (7 GHz to 8 GHz) satellite ground terminals. The concept of an SHF terminal small enough to be carried on a man's back was further developed. Field trials models weighing 17 Kg including antenna, power supply and carrying frame were manufactured and extensively trailed in field conditions. As currently configured, the equipment provides either 50 bit/sec. telegraph or analogue speech (both duplex). A digital secure speech facility is currently being developed. Depending on the satellite antenna system in use the terminal can either be worked to a main satellite ground station or another small station. The equipment characteristics allow it to operate freely with the SKYNET, DSCS and NATO satellites. The performance of the station and its principal components are outlined, together with current developments. Author

N85-20760# Marconi Space and Defence Systems Ltd., Bushey (England).
TACTICAL SATELLITE TERMINALS FOR LAND AND AIRBORNE C3 APPLICATIONS Abstract Only
P. A. Law and D. Cummings *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The increasing RF power that has become available from the growth in size of satellites over the years was used by the owners of satellite systems in a number of different ways. Civil authorities such as PTTs and Commercial Carriers have used the extra power for increased channels and for higher data rate services, third world nations have benefited from simpler and cheaper earth stations and the military have developed a whole range of small terminals for tactical use. The operational need for long distance, continuously available, error-free communication and the melding of Communications with Command and Control is discussed. Ground satellite terminals in use and in development are described and their technical characteristics discussed. Current work on a satellite terminal for the Nimrod long range maritime patrol aircraft are described. Techniques employed such as spread-spectrum modulation and frequency hopping for terminals operating in the military SHF satellite band are considered. B.W.

N85-20761# Air Force Space Div., Los Angeles, Calif.
THE GLOBAL POSITIONING SYSTEM (GPS): PROGRAM STATUS UPDATE Abstract Only
Wayne H. Jones *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The Global Positioning System (GPS) has the capability to passively provide position location to within a 15 meter SEP on a worldwide, day or night, all weather basis. It can also provide better than 100 nanosecond timing accuracy and 0.1 meter per second velocity accuracy. The system's capabilities offer a wide range of military applications and will enable users to operate with enhanced performance. The system consists of a space segment, control segment, and user segment. The GPS program proceeded into full-scale development in 1979 after a highly successful concept validation phase. Field testing of the user equipment began in January 1983, and the DSARC 3 production decision is scheduled for May 1984. A status update of each of the three segments is presented, including system capabilities, test results, schedule, and future plans. Some special system features and logistics and operational considerations are addressed. User equipment development and testing are given primary emphasis. B.W.

N85-20762# Aerospace Corp., Los Angeles, Calif.
GPS SYSTEM FIELD TESTING c04
J. M. Clifford *In* AGARD Space System Applications to Tactical Operations Oct. 1984 17 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The test program for Global Positioning System GPS Phase User Equipment (UE) is extensive. It includes seven different kinds of tests ranging from in-plant tests to initial operational test and evaluation. They differ by time, purpose, and test agency. Field development, tests, and evaluation (DT&E) tests are described. B.W.

N85-20763# Air Force Space Div., Los Angeles, Calif.
POTENTIAL IMPACT OF NAVSTAR GPS ON NATO TACTICAL OPERATIONS
E. M. Price and B. Sprosen *In* AGARD Space System Applications to Tactical Operations Oct. 1984 5 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The NAVSTAR Global Positioning System was created when the United States Deputy Secretary of Defense directed that separate efforts by the U.S. Navy and the U.S. Air Force to develop a satellite-based navigation system be combined into a single program and placed under the executive control of the USAF. In 1978, at the invitation of the United States, nine NATO nations joined the project by establishing a NATO team at the NAVSTAR Joint Program Office. NATO involvement in the program is discussed and some of the unique, operationally significant features of the system are presented. A few representative operational scenarios where the benefits of NAVSTAR would be particularly useful are presented. B.W.

N85-20764# Aerospace Corp., Los Angeles, Calif.
COVERAGE AND BUILDUP OF THE NAVSTAR CONSTELLATION c04
P. Kruh *In* AGARD Space System Applications to Tactical Operations Oct. 1984 10 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

NAVSTAR is now in Phase 2, the full-scale engineering phase. During this phase, a constellation is being maintained with four to five vehicles to support testing. A buildup of the constellation of 18 space vehicles and three active spares will begin in 1986 and will take approximately 2 years to complete. The coverage with the operational constellation is discussed and the factors that determine a strategy for the buildup are detailed. Information on the navigation capabilities that will be available during the transition from the test to the operational constellation is provided. The test configuration provides several hours of navigation coverage over selected regions of the Earth. As the constellation is built up, availability to users will increase in both duration and in the areas of coverage on Earth. About midway through the buildup, complete worldwide, two-dimensional navigation coverage will be achieved. The performance measures, the constraints, and the objectives used in determining the buildup strategy are all discussed. The performance achieved during the buildup using a candidate strategy is presented. B.W.

N85-20765# Tactical Air Command, Langley AFB, Va.
TACTICAL APPLICATIONS OF GPS USER EQUIPMENT Abstract Only
Gary M. Barbee *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The Global Positioning System GPS user equipment is described with emphasis on system strengths and weaknesses which affect its tactical applications. GPS operation is discussed as well as signal outages, selective availability, jamming scenarios, and vulnerability. Previous test results, expected future testing and demonstrated capabilities such as passive rendezvous, precision runway approach and blind bombing are described. Integration and aircraft installation programs are also addressed along with rationale for TAF GPS aircraft priorities, concepts of operations for search and rescue, special operations, reconnaissance and master navigation plan impacts. B.W.

N85-20766# Air Force Space Div., Los Angeles, Calif.
DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP)
Justin A. Curtis and Charles P. Arnold, Jr. *In* AGARD Space System Applications to Tactical Operations Oct. 1984 4 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The Defense Meteorological Satellite Program (DMSP) is a total satellite system composed of spacecraft with meteorological sensors, an Earth-based command and control network, fixed and mobile user stations, and a communication network linking the various segments together. The mission of DMSP is to provide global meteoroloical data to Tri-Service Commanders in support of worldwide military operations, both strategic and tactical, and to advance spaceborne meteorological sensing technology to meet changing Department of Defense requirements. B.G.

N85-20767# Air Weather Service, Scott AFB, Ill.
MILITARY APPLICATIONS OF METEOROLOGICAL SATELLITE (METSAT) DATA
Norman P. Rauscher *In* AGARD Space System Applications to Tactical Operations Oct. 1984 3 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The military applications of METSAT data and, in particular, Air Weather Service's (AWS) processing and use of data from the US Department of Defense METSAT, the polar-orbiting Defense Meteorological Satellite Progam (DMSP) are addressed. The primary mission of AWS is to support US Air Force and US Army operations. In modern warfare, the presence or absence of clouds directly impacts the ability to successfully and economically perform the military missions, and with the recent development of extremely expensive cloud-sensitive weapon systems, the accuracy of cloud information assumes an even greater role. AWS processes and uses all available data to satisfy mission requirements. Peacetime cloud data sources include the DMSP, NOAA polar orbiting and geostationary satellites, worldwide surface and upper air weather data, and foreign geostationary METSATs. In wartime, the Defense Meteorological Satellite Program may be the only consistent source of meteorological data. DMSP provides data to AWS in two modes - direct readout and recorded. Direct readout data are received through transportable terminals on land and sea and provide direct cloud imagery support to Army and Air Force field commanders and Navy operations afloat. Recorded DMSP data received at the Air Force Global Center (AFGWC) and the Fleet Numerical Oceanography Center (FNOC) are processed and used to support worldwide operations such as joint military exercises, aerial refueling missions and many more. Author

N85-20768# National Oceanic and Atmospheric Administration, Washington, D. C.
CIVIL WEATHER SATELLITE SYSTEMS c47
Donald B. Miller *In* AGARD Space System Applications to Tactical Operations Oct. 1984 10 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

An overview of the presently operating U.S. civil weather satellites, their space and ground systems and their data distribution systems is provided. Examples of the data products available from the satellites are provided with emphasis on their potential application to the support of tactical operations. The products from the civil weather satellites include multi-spectral imagery on several time and space scales and quantitative products that are of use in providing weather support to tactical planners. The present DoD-Civil weather satellite cooperative arrangements are reviewed with a discussion of the shared processing arrangements currently being implemented. A brief overview of international weather satellite coordination is also provided. An outlook of future

trends in the development of future civil weather satellite systems is also provided. B.G.

N85-20769# Meteorological Office, Bracknell (England).
METEOROLOGICAL AND OCEANOGRAPHIC SUPPORT DURING THE FALKLANDS CONFLICT
I. J. W. Pothecary and J. Marsh *In* AGARD Space System Applications to Tactical Operations Oct. 1984 7 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

During Operation Corporate the United Kingdom faced the task of making opposed landings on South Georgia and the Falkland Islands 8,000 miles from the home base in the advancing southern winter. Meteorological and oceanographic support of a high standard was provided throughout the conflict because of the availability of data from orbiting (NOAA-6 and NOAA-7) and geostationary (GOES-E and METEOSAT) weather satellites. The Meteorological Office 15-level global atmosphere numerical model was brought into routine use to cover the South Atlantic, four months ahead of schedule. Satellite temperature soundings (SATEMs) from the Tiros Operational Vertical Sounders (TOVS) on NOAA-6 and NOAA-7 provided essential data for the numerical model. Under a special arrangement with the United States at a later stage in the conflict successive NOAA-6 and NOAA-7 Advanced High Resolution Infra-Red (AVHRR IR) passes over the South Atlantic and South America were combined into composite pictures and the data was transmitted to the United Kindgom. The composites were used to select areas of special interest which were then examined at up to full resolution. Processed data included multi-spectral color images and sea surface temperature profiles which were invaluable in positioning units of the Task Force to take maximum advantage of oceanographic, sea fog or cloud conditions. Author

N85-20770# Royal Aircraft Establishment, Farnborough (England). Space and New Concepts Dept.
DEVELOPMENT OF SATELLITE DATA PRESENTATION FOR ENVIRONMENTAL FORECASTING
D. W. S. Lodge and M. R. Roswell *In* AGARD Space System Applications to Tactical Operations Oct. 1984 13 p refs (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The techniques developed during and since the operation to recover the Falkland Islands using image processing to enhance the value of meteorological satellite images for environmental forecasting are discussed. Data were used from METEOSAT, GOES-E and NOAA 7 AVHRR. Among the methods adopted were the production of time-lapse sequences of images and multi-temporal color composites for the analysis of weather system dynamics, multi-spectral color composites for cloud type identification and radiance temperature measurements used for sea surface temperature measurement, ice detection and fog discrimination. Some of the problems encountered are described and how they were overcome. The image processing system used was prototype for a Satellite Environmental Data Acquisition System about to enter service with CINCFLEET Weather and Oceanographic Center. Author

N85-20771# Naval Air Station, Norfolk, Va. Eastern Oceanography Center.
PRACTICAL APPLICATIONS OF SATELLITE-DERIVED METEOROLOGICAL AND OCEANOGRAPHIC DATA IN NAVAL OPERATIONS
Charles A. Weigand *In* AGARD Space System Applications to Tactical Operations Oct. 1984 8 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

Environmental data derived from satellites give the military commander critical information upon which to base decisions. Since the air-ocean environment can significantly alter the performance of today's technologically-advanced weapons and sensors, the military commander must have access to all factors affecting them. The Satellite-data Processing and Display System (SPADS) at the Naval Eastern Oceanography Center in Norfolk, Virginia is a computer-based system which produces high quality, real time satellite imagery and data with which to assess meteorological and oceanographic conditions. SPADS allows the tactical analyst to receive imagery in real time, process and display it and interact with the image to maximize extraction of relevant data. The system is described and case examples are discussed which demonstrate the capabilities of such a system and show how satellite imagery can be applied to various operational situations. Author

N85-20772*# National Aeronautics and Space Administration, Washington, D. C.
STATUS OF THE NATIONAL SPACE TRANSPORTATION SYSTEM Abstract Only **c16**
James A. Abrahamson *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01 CSCL 22B

The National Space Transportation System is a national resources serving the government, Department of Defense and commercial needs of the USA and others. Four orbital flight tests were completed July 4, 1982, and the first Operational Flight (STS-5) which placed two commercial communications into orbit was conducted November 11, 1982. February 1983 marked the first flight of the newest orbiter, Challenger. Planned firsts in 1983 include: use of higher performance main engines and solid rocket boosters, around-the-clock crew operations, a night landing, extra-vehicular activity, a dedicated DOD mission, and the first flight of a woman crew member. By the end of 1983, five commercial payloads and two tracking and data relay satellites should be deployed and thirty-seven crew members should have made flights aboard the Space Shuttle. Author

N85-20773*# National Aeronautics and Space Administration, Washington, D. C.
SHUTTLE/CENTAUR UPPER STAGE CAPABILITY **c16**
Harry J. Clark *In* AGARD Space System Applications to Tactical Operations Oct. 1984 5 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01 CSCL 22B

A joint project to design, develop, procure, and produce Centaur upper stages for use with the Space Shuttle is discussed. A common Centaur G stage 6 meters (19.5 feet) in length is being jointly developed. A longer version designated Centaur G Prime is being developed by NASA to accomplish the Galileo and International Solar-Polar Mission flights in 1986. The Centaur G and G Prime will have the capability to place, respectively, approximately 4540 kilograms (10,000 pounds) and 5910 kilograms (13,000 pounds) into geosynchronous orbit from a standard Shuttle parking orbit of 278 kilometers (150 nautical miles) and Shuttle performance (lift) capability 29,500 kilograms (65,000 pounds). The advent of high energy upper stage capability in 1986 will permit space users and spacecraft developers to utilize spacecraft growth, stage combination concepts with storage modules, teleoperator systems, and other mission peculiar devices to satisfy complex mission demands. These capabilities should greatly enhance the usefulness of the space environment and stimulate mission planners toward conception of innovative means to meet ever increasing mission requirements. R.J.F.

N85-20774# Centre National d'Etudes Spatiales, Paris (France).
THE ARIANE FAMILY [LA FAMILLE ARIANE] **c15**
R. Vignelles *In* AGARD Space System Applications to Tactical Operations Oct. 1984 6 p In FRENCH; ENGLISH summary (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The development of the ARIANE launch vehicle was completed with the success of two qualification launches. This program led to an operational vehicle able to launch payloads of about 1800 kg on transfer to geostationary orbit. Two complementary development phases were decided in order to optimize the launch vehicle with respect to the evolution of payloads and thus to increase competitivity. The ARIANE 3 model is able to launch 2600 kg in

transfer and is scheduled to begin operations in 1983. The ARIANE 4 has six different models for payloads ranging from 2000 kg to 4300 kg and will be available at the end of 1985. In parallel, the commercial credibility of ARIANE launch vehicles is being increased by the completion of the second launch pad in Kourou (French Guyana) that will start operations at the beginning of 1985. R.F.J.

N85-20775# Ford Aerospace and Communications Corp., Sunnyvale, Calif.
COMBAT CAPABLE SPACE SYSTEMS FOR TACTICAL SUPPORT
Jerry O. Cochran *In* AGARD Space System Applications to Tactical Operations Oct. 1984 7 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

An overall strategy for providing a dispersed, survivable space system in response to projected Soviet threat capabilities is described. The physical and electro-optical threats are briefly outlined and countermeasures proposed. Strategies designed to deploy an interconnected space/ground complex so large that attack becomes impractical in terms of resources required for effective neutralization are emphasized. Recognizing that space systems exist only to support ground functions dictates that ground networks must also operate in crisis periods. Though a few large ground facilities may be justified as cost-effective in peacetime, these same facilities become critical choke points in wartime. These vulnerable nodes must be augmented by a dispersed network of interoperable mobile ground terminals such as the Transportable/Mobile Ground Station (T/MGS) capable of supporting a wide range of satellites, and the Single Channel Objective Tactical Terminal (SCOTT) which can bring survivable space support directly to troops in the field. R.J.F.

N85-20776# Centre National d'Etudes Spatiales, Paris (France). Applications Program Division
THE SPOT OPERATIONAL REMOTE SENSING SATELLITE SYSTEM: CURRENT STATUS AND PERSPECTIVES c43
Gerard Brachet *In* AGARD Space System Applications to Tactical Operations Oct. 1984 13 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The SPOT program, comprising Earth observation satellites and ground receiving stations is discussed. The first satellite, due for launch in 1985, will carry a payload of two identical high resolution visible instruments using CCD linear arrays technology. These will make images of the Earth with sampling step of 20 meters in three color bands in the visible range and in the near infrared, and with a sampling step of 10 meters in a broad, panchromatic band: i.e., in black and white. This configuration is suitable for observing the small agricultural plots found in many countries. It also satisfies some conventional cartographic requirements. Sidelooking capability will allow the satellite to observe any region of the Earth at intervals of one to several days, thus allowing relatively fast changing phenomena to be monitored. It will also be possible to provide for stereoscopic vision by associating views taken from different angles. R.J.F.

N85-20777# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
THE ESA REMOTE SENSING SATELLITE SYSTEM (ERS-1) c43
Erich H. Velton *In* AGARD Space System Applications to Tactical Operations Oct. 1984 11 p ref (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The ERS-1 remote sensing system is presently in the definition phase. The system development will start in early 1984, launch of the first satellite is planned for mid 1988 from Guyana Space Centre by the European launcher ARIANE. The ERS-1 system development will be performed jointly by the member states of the European Space Agency together with Norway and Canada. Mission objectives, system elements, instruments, data processing, and ground support are discussed. R.J.F.

N85-20778# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
A MODERN APPROACH OF A SYNTHETIC APERTURE RADAR PROCESSOR AND ITS TECHNOLOGICAL ASPECTS c32
Horst Froehlich and Roland Schotter *In* AGARD Space System Applications to Tactical Operations Oct. 1984 7 p ref (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

A flexible hardware concept is presented which allows the handling of high speed image processing tasks. The concept is applied to a realtime synthetic aperature radar (SAR) processor covering C-band ERS-1 as well as X-band radar data. SAR principles, the SPECAN-algorithm which is made use of in the processor breadboard, some of the basic hardware processing modules, and performance data are described. The performance data show that high speed image processing can be implemented at low power consumption and small volume. Due to the universal concept, cost can also be kept down for this class of processing tasks. R.J.F.

N85-20779# National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES RESEARCH USING THE SHUTTLE IMAGING RADAR SYSTEM Abstract Only c43
R. Monson and Charles Elachi (JPL) *In* AGARD Space System Applications to Tactical Operations Oct. 1984 1 p (For primary document see N85-20751 11-66)
Avail: NTIS HC A09/MF A01

The Shuttle Imaging Radar (SIR) is an L-band synthetic radar that transmits and receives horizontally polarized microwave radiation. It was originally launched on the second Shuttle test flight (STS-2) in November 1981 with the antenna depression angle fixed at 43 deg. In this configuration, the radar system was referred to as SIR-A, and it collected more than then a million square kilometers of Earth imagery in a variety of areas situated between 38 deg north and south latitude. SIR-A data was optically recorded onboard the Shuttle, and it was subsequently correlated on the ground to produce imagery with a 50 kilometer swath width and a surface resolution of approximately 40 meters. The SIR is presently being upgraded into a new configuration termed SIR-B, in which the radar's antenna can be mechanically rotated in the Shuttle's payload bay during an orbital mission. SIR-B is currently scheduled for flight on the seventeenth Shuttle mission (STS-17) that is tentatively planned for August 1984. In its new configuration, the SIR-B can be used to image selected regions at different angles of incidence ranging from 15 deg to 60 deg (as measured from the local vertical). In principle, multiple incidence angle radar imagery of selected areas can be coregistered and used to differentiate surficial materials on the basis of their roughness characteristics. This procedure is conceptually similar to the use of multispectral imagery acquired at shorter wavelengths to discriminate surficial materials on the basis of their pigmentation. R.J.F.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-20780# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
FUNCTIONAL EQUATION FOR THE EMBEDDING OF A HOMOMORPHISM OF THE INTERVAL INTO A FLOW
W. A. Beyer and P. J. Channell 1984 12 p refs Presented at the Intern. Symp. on Iteration Theory and its Funtional Equations, Lochau, Austria, 27 Sep. - 2 Oct. 1984
(Contract W-7405-eng-36)
(DE85-000655; LA-UR-84-3089; CONF-8409172-1) Avail: NTIS HC A02/MF A01

A functional equation phi((LC OMEGA)(x)) = (LC OMEGA)'(x) for phi(x) is derived for the problem of finding phi so that for a given orientation on preserving everywhere differentiable homo-

morphism (LC OMEGA) (x) of [0,1] with (LC OMEGA)' not equal to 0, there exists a solution F(x,t) to F sub t (x,t) = phi(F) so that F(x,0) = x, F(x,1) = (LC OMEGA) (x). A solution to the functional equation is given for the case where (LC OMEGA) has a finite number of fixed points a sub i with (LC OMEGA)'(a sub i) not equal to 1. The analogous equation in n-dimensional space is given. DOE

N85-20781# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE STUDY OF PERTURBATIONAL STABILIZATION Ph.D. Thesis - Lille Univ.
O. Vidal 1984 199 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-905) 2 Vol.
(ONERA-NT-1984-1; ISSN-0078-3781) Avail: NTIS HC A09/MF A01

The possibility of stabilizing systems by introducing perturbations of their parameters, without modifying variables or applying feedback was studied. Periodical, almost periodical, and random perturbations are considered. Continuous linear systems and quadratic and bilinear continuous and discrete systems are presented, as perturbational stabilization gives effective theoretical and experimental results for these. Weakly nonlinear systems can be stabilized by introducing zero-mean oscillations in the nonlinear part of the system using the averaging method.
Author (ESA)

N85-20669# Grenoble-1 Univ. (France).
ON THE DISTRIBUTION OF INTEGRAL AND PRIME DIVISORS WITH EQUAL NORMS
B. Z. Moroz *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 1-17 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20670# Grenoble-1 Univ. (France).
THE MILNOR LINK OF A LOCAL FIELD TO A PERFECT RESIDUE FIELD [L'ANNEAU DE MILNOR D'UN CORPS LOCAL A CORPS RESIDUEL PARFAIT]
Bruno Kahn *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 19-65 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20671# Grenoble-1 Univ. (France).
AN EXTENSION OF THE GLEASON PROBLEM IN PSEUDOCONVEX DOMAINS [SUR UNE EXTENSION DU PROBLEME DE GLEASON DANS LES DOMAINES PSEUDOCONVEXES]
Joaquin Ma. Ortega *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 67-74 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20672# Grenoble-1 Univ. (France).
CONTRIBUTION OF THE CUP-PRODUCT OF MILNOR'S FIBER WITH /f/ SUP 2 LAMBDA POLES [CONTRIBUTION DU CUP-PRODUIT DE LA FIBRE DE MILNOR AUX POLES DE /F/ SUP 2 LAMBDA]
Daniel Barlet *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 75-107 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20677# Grenoble-1 Univ. (France).
RIEMANN FOLIATIONS ON SIMPLY CONNECTED VARIETIES [FEUILLETAGES RIEMANNIENS SUR LES VARIETES SIMPLEMENT CONNEXES]
Etienne Ghys *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 203-223 refs In FRENCH; ENGLISH summary (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

N85-20678# Grenoble-1 Univ. (France).
TOPOLOGICAL TRIVIALITY OF VERSAL UNFOLDINGS OF COMPLETE INTERSECTIONS
James Damon *In its* Ann. of the Fourier Inst., Vol. 34, No. 4 1984 p 225-251 refs (For primary document see N85-20668 11-59)
Avail: NTIS HC A12/MF A01

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-20782# California Univ., Berkeley. Lawrence Berkeley Lab.
DEVELOPMENT OF HIGH FIELD Nb-Ti ACCELERATOR DIPOLES
W. Hassenzahl, W. Gilbert, and C. Peters Sep. 1984 7 p refs Presented at the Appl. Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000621; LBL-17633; CONF-840937-11) Avail: NTIS HC A02/MF A01

A four layer, 5 cm beam tube aperture, 1-m, long model accelerator dipole was built. The conductor for this dipole was graded. The cable used for the inner two layers has about 30% more superconductor than that in the outer two layers, so the conductors reach the short sample limit at nearly the same current. This magnet is the third of a series of high field dipoles under development. The magnitude and distribution of prestress in the assembled coil are quite important. The stress in each layer was measured and adjusted quite closley during the assembly process. The magnet achieved 9.08 T at 1.8 K and 7.15 T at 4.4 K. The fields appear to correspond to the critical current limits of the conductors in the region of the splice between layers 3 and 4. Training behavior, ramp rate sensitivity and magnetic field measurements are described. DOE

N85-20783# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.
THEORETICAL DETERMINATION OF SURFACE MAGNETISM
M. Weinert, A. J. Freeman (Northwestern Univ., Evanston, Ill.), S. Ohnishi (NEC Corp., Kawasaki, Japan), and J. W. Davenport 1984 24 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27 Nov. 1984
(Contract DE-AC02-76CH-00016; Grant NSG DMR-82-16543)
(DE85-003224; BNL-35315; CONF-841184-14) Avail: NTIS HC A02/MF A01

The theoretical determination of the magnetic structure of surface within the (local) spin density formalism is briefly described. The feasibility of using such methods for determining delicate magnetic quantities is illustrated by calculation of the Knight shift of the paramagnetic Pt(001) surface, the magnetization of the clean and Ag-covered Fe(001) surface, and the effect of a p(1x1) H overlayer on the magnetization of the Ni(001) surface. These results demonstrate that it is possible not only to make quantitative predictions for real systems, but more importantly, one gains insight into the underlying physics at surfaces. DOE

N85-20784# California Univ., Berkeley.
AEM WITH A CONVERGENT BEAM
M. Sarikaya and G. Thomas Jul. 1984 29 p refs
(Contract DE-AC03-76SF-00098)
(DE85-000667; LBL-18340; CONF-840767-7) Avail: NTIS HC A03/MF A01

Convergent beam electron diffraction (CBED) was used to perform analytical microscopy and crystallography analysis. The following applications of this technique are described: phase identification in iron-oxide and Mn-Al-C magnets and symmetry analysis of (gamma)'-precipitates in an Al-Ag system. Ways of measuring foil thickness by CBED are assessed. DOE

N85-20785# Danish Meteorological Inst., Copenhagen.
NOTE OF THE DYNAMIC BEHAVIOR OF A MAGNET SYSTEM SUSPENDED BY A THIN FIBER, WITH SPECIAL REFERENCE TO THE QUARTZ HORIZONTAL MAGNETOMETER (QHM)

E. Kringlauridsen 1984 16 p refs
(DMI-Geophys-Papers-R-70; ISBN-87-7478-235-5) Avail: NTIS HC A02/MF A01

The equations of motion for a magnet system suspended by a thin fiber are derived. It is shown that coupling exists between the usual torsional oscillations and pendulum oscillations, as well as wriggling of the rod. This coupling is proportional to the force downward and it is therefore advantageous to place a quartz horizontal magnetometer in a compensated vertical field when the induction coefficient is determined. If the magnet is strong and small it may be useful to mount a vane on the magnet system in order to increase the moment of inertia. Author (ESA)

N85-20786# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS Abstracts Only
9 Jan. 1985 35 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UPM-85-001) Avail: NTIS HC A03/MF A01

Research results are presented on many different topics in the U.S.S.R. report. Topics covered include: (1) acoustics; (2) crystals and semiconductor; (3) fluid dynamics; (4) lasers and masers; (5) molecular physics; (6) optics and spectroscopy; (7) optoelectronics; (8) plasma physics; and (9) stress, strain and deformation. For individual titles, see N85-20787 through N85-20819.

N85-20787# Joint Publications Research Service, Arlington, Va.
PROBLEM OF FREQUENCY SPACE VARIATION OF SONIC FIELD IN STRATIFIED MEDIA Abstract Only c71
G. K. Ivanova *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 1 Transl. into ENGLISH from Akusticheskiy Zh. (USSR), v. 30, no. 4, Jul.-Aug. 1984 p 490-494 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The frequency space distribution of a sonic field was studied. An analytic description of the lines of maximum values of the square of sound pressure on the plane of frequency versus distance to source is presented. An equation was derived which yields an expression for the slope of the line through the parameters of the interference structure for all mode numbers. The equations for the lines of interference maxima here presented can be used to determine the nature of dispersion in actual stratified media by empirical selection of an analytic expression for the lines of the interference structure. The slope of the line allows determination of the difference in propagation times of mode and measurement of this difference if the interference wavelength is known. Author

N85-20788# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF PRESSURE ON SPEED OF SOUND IN SINGLE-PHASE REGION OF STRATIFYING MIXTURES Abstract Only c71
A. S. Baklagin, S. P. Dmitriyev, and V. V. Sokolov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 1 Transl. into ENGLISH from Izv. Vysshiki Ucheb. Zaved., Fizika (USSR), v. 27, no. 6, Jun. 1984 p 120-121 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The miscibility of the components of binary liquid systems under high pressure was investigated. The objects studied were mixtures with high critical stratification temperatures: nitrobenzol-n-hexane and aniline-cyclohexane. The velocity and coefficient of absorption of ultrasonic waves, shift viscosity and density were measured using an experimental setup described elsewhere. The speed of sound was investigated as a function of pressure and the composition of the mixtures. The density is found to be a monotonic function of the composition of the mixture. Author

N85-20789# Joint Publications Research Service, Arlington, Va.
GENERATION OF SOUND BY A VORTEX POINT IN A STEADY FLOW OF SLIGHTLY COMPRESSIBLE FLUID Abstract Only c71
S. G. Kasova and N. N. Andreyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 2 Transl. into ENGLISH from Akusticheskiy Zh. (USSR), v. 30, no. 4, Jul.-Aug. 1984 p 502-506 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The planar time-independent motion of a non-viscid, slightly compressible fluid along the X axis of a cartesian coordinate system was studied. The problem of radiation of sound by a vortex point in the flow was solved assuming arbitrary curvature of flow lines in a certain limited area, yielding a power series in Mach numbers with coefficients which vary as a function of the Lagrangian coordinates of the vortex. Time-independent flow around a circular cylinder by an ideal slightly compressible fluid was studied as an example of application of the procedure. The radiation spectrum of the vortex point in the perturbed time-independent flow is a diverging cylindrical wave with dipole directivity along its axes. The dipole radiation coefficients are the Fourier transforms of the cartesian coordinates of the point in the flow where the vortex point is introduced. Author

N85-20790# Joint Publications Research Service, Arlington, Va.
PHONON-IMPURITY RELAXATION AND ACOUSTIC WAVE ABSORPTION IN YTTRIUM-ALUMINUM GARNET CRYSTALS WITH IMPURITIES Abstract Only c76
S. N. Ivanov, I. M. Kotelyanskiy, and V. V. Medved *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 3 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 3, Mar. 1984 p 641-647 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The contribution of scattering of thermal phonons on impurities in YAG to change in wave absorption and establishment of temperature relationships between the elastic and nonelastic relaxation times was investigated. It was found that the absorption of acoustic waves and YAG crystals containing rare-earth impurities is determined at certain temperatures by the scattering of thermal phonons on oscillations of the impurity atoms. Phonon-impurity relaxation processes have maximum influence on wave absorption, and are resonant in nature when the wave interacts with a group of thermal phonons at frequencies close to the oscillating frequencies of the impurity atoms. Investigation of wave absorption in pure YAG and YAG with impurities revealed a strong quantitative difference in the characteristic relaxation times for waves of different polarizations. Author

N85-20791# Joint Publications Research Service, Arlington, Va.
ELECTRON-OSCILLATORY SPECTRA OF YTTRIUM-ERBIUM-ALUMINUM GARNET OF CRYSTALS AND THEIR ROLE IN LASER PUMPING Abstract Only c76
Sh. Dzheordzhesku, V. I. Zhekov, T. M. Murina, M. N. Popova, and M. I. Studenikin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 3-4 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 3, Mar. 1984 p 641-647 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

Pumping of an erbium laser with (Y(1-x)Er(x))3Al5O12 crystals was investigated. It was found that narrow electron lines in the spectra of (Y(1-x)Er(x))3Al5O12 crystals are accompanied by comparatively weak electron oscillatory transitions were compared with infrared spectroscopy and Raman scattering data, indicating that the extent of the electron-oscillatory transition region is the same as that of the oscillatory spectrum for (Y(1-xEr(x))3Al5O12 crystals, and that the many frequency differences between the electron lines and maxima in the electron oscillatory tail coincide with the IR and Raman scattering active frequencies of the center of the Brillouin zone. Author

N85-20792# Joint Publications Research Service, Arlington, Va.
PARACHUTE INFLATION DYNAMICS Abstract Only c02
S. M. Belotserovskiy, I. V. Dneprov, A. T. Ponomarev, and O. V. Rysev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Mekhanika Tverdogo Tela (Moscow), no. 3, May-Jun. 1984 p 174-179 Original language document was announced as

A84-47390 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The parachute opening process is investigated by combining numerical methods of nonlinear aerodynamics with elasticity theory. The approach, which involves joint integration of the equations of unsteady nonlinear aerodynamics and elasticity relationships of the kind proposed by Rakhmatulin (1975), has been implemented in computer software. The aerodynamic load is determined by using the Cauchy-Lagrange integral with allowance for the flow and parachute deformation history. V.L.

N85-20793# Joint Publications Research Service, Arlington, Va.
PRE-TURBULENCE: TRANSITIONAL LAMINAR-TURBULENT FLOWS Abstract Only c34
A. G. Bershadskiy *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 5-6 Transl. into ENGLISH from Magnitnaya Gidrodinamika (USSR), no. 2, Apr.-Jun. 1984 p 54-60 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The transition to turbulence during longitudinal flow about a flat plate in the presence of an initial turbulent background was investigated theoretically and experimentally, with allowance for random diffusion of liquid particles associated with the random nature of their movement. The influence of a magnetic field on the transition to turbulence in the boundary layer was investigated, indicating that a longitudinal magnetic field amplifies white noise in the flow region next to the wall. It was found experimentally that longitudinal velocity pulsation increases somewhat for small Hartman numbers. Author

N85-20794# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF FLOW OF OSCILLATORY-RELAXING GAS IN NOZZLES WITH CONSTANT CROSS-SECTIONS IN THROAT REGION Abstract Only c34
V. A. Salnikov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 6 Transl. into ENGLISH from Zh. Prikladnoy Mekhaniki i Tekhnicheskoy Fiz. (USSR), no. 3, May-Jun. 1984 p 61-66 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

A steady two-dimensional mixed sub- and supersonic flow of a nonviscous nonheat-conducting oscillatory-relaxing gas in flat compression-expansion nozzles having an area with a fixed cross section in the throat area and two bends in the contour at the beginning and end of the fixed area was investigated. The results were obtained by solving gas dynamic equations and relaxation kinetic equations simultaneously based on the approach used for the direct problem of the flow of gas in a Laval nozzle in the presence of non-equilibrium physico-chemical processes. When 1 sub p > 2(1 sub p = L sub p/(h*/2), where L sub p is the length of the area with fixed-cross section of diameter h* in the throat region, all of the oscillatory energy stored in the subsonic part of the nozzle is lost. Author

N85-20795# Joint Publications Research Service, Arlington, Va.
FREQUENCY SPECTRA OF TURBULENT PULSATIONS IN STABILITY OF LAMINAR BOUNDARY LAYER Abstract Only c02
A. M. Grabovskiy and S. V. Surkov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 6 Transl. into ENGLISH from Inzhenerno-Fizicheskiy Zh. (USSR), v. 46, no. 6, Jun. 1984 p 900-904 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The characteristic frequencies of turbulent pulsations in a bounded flow of viscous liquid on a smooth plate were analyzed under the assumption that the growth and development of turbulent eddies are related to the pulsation field, and that the zone of quasi-ordered movement of the liquid is the same as the resonant zone. The assumption that turbulence is associated to resonant phenomena makes it possible to determine quite accurately the characteristic frequencies of turbulent pulsations and to explain the transition from laminar to turbulent movement. Author

N85-20796# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION OF WAVEFRONT CONJUGATION DURING MANDELSTAM-BRILLOUIN SCATTERING OF FOCUSED LASER BEAMS IN CONDENSED MEDIA Abstract Only c36
P. Y. Balkyavichyus, A. S. Dementyev, Y. P. Lukoshyus, E. K. Maldutis, and V. P. Tarulis *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 7 Transl. into ENGLISH from Litovskiy Fizicheskiy Sbornik (USSR), v. 24, no. 2, Mar.-Apr. 1984 p 81-89 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The effectiveness and quality of wavefront conjugation during stimulated Mandelstam-Brillouin scattering in acetone and optical glass was investigated as a function of the focusing conditions, spectral composition and pumping radiation powers greater than and less than the optical breakdown threshold power. It was found that when a system consisting of a spherical and cylindrical lamp is used for focusing, there is no reconstruction of the image of the wire mask in the range of powers investigated, regardless of whether a phase plate is used. The findings are important for developing short pulse wavefront conjugation schemes, and for the use of wavefront conjugation in laser systems operating in the frequency mode. Author

N85-20797# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMPURITIES ON ABSORPTION IN SEMICONDUCTORS AND LASING OF SEMICONDUCTOR LASERS Abstract Only c36
V. F. Yelesin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 7 Transl. into ENGLISH from Zh. Eksperimentalnoy i Teoreticheskoy Fiz. (USSR), v. 87, no. 1, Jul. 1984 p 135-142 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The effect of impurity scattering of electrons on absorption in semiconductors and on laser operation was examined. It was shown that during combined electron phonon and impurity scattering when the impurity scattering time is much shorter than the electron phonon scattering time, the limiting field increases by a factor of (tau sub Ph/tau sub im)sup 1/2. The behavior of the field as a function of the pumping was found to be no longer monotonic when beta is small. Combined scattering also broadens the form of the absorption curve, but to a lesser extent than previously assumed. Pure impurity scattering does not broaden the absorption line, meaning that any field remains strong. Author

N85-20798# Joint Publications Research Service, Arlington, Va.
STUDY OF LIGHT SHIFTS IN LASER PUMPED QUANTUM DISCRIMINATOR FREQUENCY Abstract Only c74
L. A. Budkin, M. N. Penenkov, A. I. Pukhtelev, and S. L. Puzanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 8 Transl. into ENGLISH from Izv. Vyssikh Uchebnykh Zavedenity, Radiofizika (USSR), v. 27, no. 6, Jun. 1984 p 705-708 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

An earlier work obtained equations for the light shifts in a quantum discriminator assuming that the excited states of the working atoms are mixed by collisions. This means that the contribution of the actual transitions of working atoms caused by pumping to the light shift of the frequency of the standard transmission need not be considered. Here it is assumed that this is true. Primary attention was given to computing the light shift under the most general assumptions concerning the spectral width of optical laser pumping. The results of the calculation were compared with experimental data in which a population inversion was achieved at the sublevels of superfine splitting using laser pumping of sup 133 Cs atoms by the D2 line with wavelength 8521 A. An experimental light shift dispersion curve was obtained on a model of the quantum discriminator with a cesium cell. The experimental and computed results agreed well qualitatively. More precise theoretical results require consideration of nonhomogeneity of pumping light intensity over the length of the cell due to absorption within the cell. R.J.F.

N85-20799# Joint Publications Research Service, Arlington, Va.
SOLID STATE LUMINESCENT LIGHT FILTERS FOR NEODYMIUM LASERS Abstract Only **c74**
V. N. Verenik, V. G. Koptev, T. M. Razvina, M. B. Rzhevskiy, A. A. Stavrov, and G. P. Starostina *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 8 Transl. into ENGLISH from Zh. Prikldnoy Spektroskopii (USSR), v. 61, no. 1, Jul. 1984 p 43-48 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The spectral luminescent properties of a number of optical filters made of doped quartz glasses are compared; their influence on the lasing characteristics of a YAG:Nd sup 3+ laser are investigated. The studies employed KIZh5 glass, as well as quartz glass made of synthetic amorphous and crystalline silicon dioxide and containing Sm sup 2+. Luminescence kinetics were investigated by using an SI-70 oscillograph. It is found that the use of quartz glasses doped with Sm sup 2+ ions and KIZh5 glass for light figures can increase the optical pumping efficiency of pulsed lasers in certain cases. Author

N85-20800# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF UNSTABLE RESONATORS IN FLASHLAMP-PUMPED ORGANIC-COMPOUND LASERS Abstract Only **c36**
V. A. Alekseyev, B. F. Trinchuk, and A. V. Shulenin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 9 Transl. into ENGLISH from Zh. Prikladnoy Spektroskoppi (USSR), v. 61, no. 1, Jul. 1984 p 28-33 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

A symmetrical confocal resonator formed by two blind convex mirrors was investigated. The space energy characteristics of radiation from a laser with an unstable resonator were investigated as a function of the specific pumping energy per cubic centimeter of active medium and the magnification of the resonator. Oscillograms of laser pulses were recorded in different cross sections of the laser beam, as were the lasing field patterns at various distances from the exit mirror of the resonator. The maximum spectral wavelengths of flat and unstable resonators were tabulated. It was found that the proper choice of parameters of an unstable resonator reduces laser beam divergence significantly and provides greater axial brightness of radiation than that provided by a flat resonator, even with a highly nonhomogeneous active medium, making it possible to extend the capabilities of flashlamp pumped organic compound lasers. Author

N85-20801# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF STRUCTURE OF THIOPYRILOCYANIC DYES ON OUTPUT CHARACTERISTICS OF PASSIVE MODE-LOCKED LASER Abstract Only **c36**
M. I. Demchuk, V. P. Mikhaylov, A. A. Ishchenko, M. A. Kudinova, A. I. Tolmachev, and K. V. Yumashev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 9 Transl. into ENGLISH from Zh. Prikladnoy Spektroskopii (USSR), v. 61, no. 1, Jul. 1984 p 21-28 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The influence of the structure of thiopyrilocyanic dyes on the output characteristics of lasers was investigated for use in passive shutters for mode locking in order to select a dye which provides good radiation parameters and to develop practical recommendations on the synthesis of new dyes to improve the parameters of passive mode locked lasers. Symmetrical thiopyrilocyanic dyes and their analogs were investigated. The laser radiation parameters were studied on a setup employing an yttrium-aluminum garnet as the active element, with the dye solution held in contact with a rear spherical mirror 2500 mm in diameter. The laser radiation parameters were tabulated for a series of polymethane dyes with different molecular structures. The findings make it possible to synthesize optimal absorbers from available components. Author

N85-20802# Joint Publications Research Service, Arlington, Va.
LASING CHARACERTISTICS OF YAG: Nd(3+)-LASER WITH LIF PASSIVE SHUTTER WITH F2 COLOR CENTERS Abstract Only **c36**
S. G. Grafenshteyn, N. A. Ivanov, D. V. Inshakov, I. A. Partianovich, A. A. Fomichev, V. A. Chepurnoy, and M. A. Yakshin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 10 Transl. into ENGLISH from Pisma v Zh. Tekhnicheskoy Fiziki (USSR), v. 10, no. 14, 26 Jul. 1984 p 847-850 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

Lasing was obtained at 1111.2, 1115.95 and 1122.5 nm in a YAG:Nd sup 3+ laser with an LiF shutter with F2 color centers. The experiments were conducted in a plane parallel resonator with mirrors having respective coefficients of reflection in the 100 to 1200 nm band of 100 and 60%. The active element was 65 x 4 mm and was pumped by an ISP-2500 impulse lamp. The shutter was an LiF crystal subjected to radiation at T=50 K with F2 centers. The shutter served as a selective amplifier within the cavity and promotes a drop in the lasing threshold on weak 4 sub F sub 3/2 approaches 4 sub J sub 11/2 in Nd sup 3+. The radiation energy was increased by amplification through effective nonlinear conversion of the radiation frequencies on the LiJO3 crystal, making it possible to expend the tuning range of neodymium garnet lasers in the visible and near infrared regions of the spectrum. Author

N85-20803# Joint Publications Research Service, Arlington, Va.
DISTORTION OF TEMPORAL CHARACTERISTICS DURING PARAMETRIC UP-CONVERSION OF ULTRASHORT LASER PULSES Abstract Only **c36**
G. M. Gandelman, O. Yu. Itskovich, P. S. Kondratenko, S. S. Sobolev, B. M. Stepanov, and S. F. Chalkin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 10 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1348-1352 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

Distortion of the temporal behavior of IR pulses during parametric up conversion was examined. The field behavior at the combined frequency was determined as a function of the fields at frequencies mixed in a nonlinear medium which holds for signals with durations ten to the minus tenth power to ten to the minus twelfth power seconds. Three methods of recovering the form of the temporal behavior of IR pulses based on parametric up conversion were analyzed. Author

N85-20804# Joint Publications Research Service, Arlington, Va.
STABILITY OF TEMPORAL AND ENERGY PARAMETERS OF PICOSECOND LANTHANUM BERYLLATE LASER Abstract Only **c36**
A. Piskarskas, V. Sirutkaytis, A. Yuozapavichyus, and A. Yankauskas *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 11 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1487-1490 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The stability of the energy and temporal parameters of a passive mode locked La2Be2O5:Nd laser employing two threshold operation was investigated. Maximum pulse lengths of approximately 7 nsec were obtained with energy stability characteristic of analogous YAG:Nd lasers. The amplification of picosecond pulses in an La2Be2O5:Nd laser was investigated. An La2Be2O5:Nd laser was employed to initiate a synchronous pumped parametric oscillator. Author

N85-20805# Joint Publications Research Service, Arlington, Va.
AUTOSTOCHASTIC BEHAVIOR OF SOLID STATE RING LASER WITH LOW FREQUENCY PERIODIC LOSS MODULATION Abstract Only **c36**
P. A. Khandokhin and Ya. I. Khanin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 11 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1483-1487 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

A solid state traveling wave YAG neodymium ring laser

employing sinusoidal loss modulation was investigated experimentally. It was found that increasing the percentage of loss modulation of the fixed frequency leads initially to nonlinear distortions of the laser response, followed by an abrupt transition to the pulse mode with a pulse repetition frequency equal to the loss modulation frequency. Increasing the modulation percentage further complicates the lasing pattern, leading to bifurcation increase in the period and finality to a mode with randomly varying amplitude and pulse repetition interval. The laser response was found to be a hysteresis function of the modulation percentage. The experimental findings agreed well with the results obtained through numerical solution of the equations for a solid state. Author

N85-20806# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF DYE LASERS PUMPED BY HIGH-POWER KrF LASER RADIATION Abstract Only c36
A. D. Klementov, N. V. Morozov, and P. B. Sergeyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 12 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1389-1393 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The lasing characteristics of ethanol solutions of rhodamine R6Zh, coumarin K47, PTP and POPOP dyes excited by radiation from a KrF laser at approximately 10 J with pulse lengths of approximately 80 nsec were investigated. Lasing energy of approximately 1.1 J with efficiency of approximately 14% was obtained for R6Zh and K47 solutions; the energy for PTP was 0.65 J, with efficiency of approximately 8%; the respective figures for POPOP were 0.3 J and 5%. The advantages and disadvantages of a number of dye laser cells designed to be pumped by high power excimer lasers were investigated experimentally. Author

N85-20807# Joint Publications Research Service, Arlington, Va.
SATURATION KINETICS OF ACTIVE MEDIUM OF OXYGEN-IODINE LASER Abstract Only c36
M. V. Zagidullin, V. I. Igoshin, and N. L. Kupriyanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 12 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1379-1389 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The saturated gain in an oxygen iodine medium was determined as a function of the intensity of the applied field and the kinetic contacts of the elementary processes, making it possible to find the saturation intensity and to estimate the characteristic intraresonator intensity. The spectral energy characteristics of chemical oxygen iodine lasers were studied under conditions of irregular broadening and finite relaxation rates. The basic processes determining the field saturation kinetics are the exchange of the electron energy of atomic iodine with molecular oxygen, translational iodine atom relaxation, Van Derr Waals mixing of 2 sub P sub 3/2 sublevels and mixing of 2 sub P sub 1/2 sublevels during exchange interaction with oxygen molecules. Translational and superfine relaxation processes were shown to play an exceptionally important role in the formation of the lasing spectrum. The influence of anomalous dispersion effects on divergence of laser radiation in the multimode lasing condition is discussed. The finite translational relaxation rate reduces the output power of the laser severalfold, and increases the length of the lasing zone. Author

N85-20808# Joint Publications Research Service, Arlington, Va.
ABSORPTION OF OZONE MOLECULES IN STRONG FIELD OF TEA CO2 INJECTION LASER Abstract Only c36
M. S. Dzhidzhoyev, V. K. Popov, V. T. Platonenko, and A. V. Chugunov *In its* USSR Rpet.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 13 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1357-1363 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The relationship between the IR radiation energy absorbed by ozone and the energy density was investigated at pressures at which collisions have a significant influence on the energy absorption mechanism but do not cause transitions between the oscillatory levels over time intervals equal to the light pulse duration. A radiation injection stabilized TEA CO2 laser was employed as the radiation source. The results obtained with and without injection were compared, indicating that the energy absorbed by the medium is proportional to the square root of the energy density for densities ranging from 0.001 to 320 J/square centimeters. Collision mode absorption of intense radiation is examined theoretically, showing qualitative agreement with the experimental findings. Author

N85-20809# Joint Publications Research Service, Arlington, Va.
NUMERICAL INVESTIGATION OF PROPAGATION OF RADIATION PULSE AT XXX Abstract Only c32
V. A. Levin, V. V. Netesov, and A. M. Starik *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 13 Transl. into ENGLISH from Zh. Prokladnoy Mekhaniki i Tekhnicheskoy Fiz. (USSR), no. 3, May-Jun. 1984 p 14-19 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The propagation of a radiation pulse at lambda = 10.6 microns absorbing medium was investigated. The influence of saturation and nonlinear processes of oscillatory energy exchange on the self stress of light beams with Gaussian profile was studied. A theoretical model was derived and illustrated. The analysis indicates that allowance must be made for the excitations of various types of oscillations of the molecules of the mixture and the finite thermalization rate of the absorbed energy, as well as saturation of the absorbing transition, for a radiation pulse propagating in gaseous resonant absorbing media. Failure to take these effects into account can result in substantial errors in determining the amplitude phase characteristics of the light beam. Author

N85-20810# Joint Publications Research Service, Arlington, Va.
DIFFUSION SEPARATION OF REACTING GAS MIXTURES Abstract Only c25
Ya. A. Buyevich and I. V. Kirnos *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 14 Transl. into ENGLISH from Inzhenerno-Fizicheskiy Zh. (USSR), v. 46, no. 6, Jun. 1984 p 922-930 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The problem of extracting a component of a chemically reactive gas mixture via selective diffusion through a semipermeable membrane was considered. A steady separation process in elementary cells with one inlet channel and one outlet channel was examined. The separation rate depends upon the mixing rates in the inlet channel and the rate of transfer to the surface of the wall, the adsorption and dissolving of gas in the wall material, the diffusion of gas in the solid solution, its desorption in the outlet channel and flow through the ladder. Material balance equations for molar flows of reagents and reaction products in the inlet channel were derived. A numerical example of a dissociation reaction is presented. Inaccuracies in the traditional description of mass exchange processes are discussed. Author

N85-20811# Joint Publications Research Service, Arlington, Va.
SPONTANEOUS DIFFRACTION OF SEQUENCE OF SUPERSHORT LIGHT PULSES IN DYE SOLUTION Abstract Only c74
G. B. Altshuler, N. R. Belashenkov, V. B. Karasev, and S. A. Kozlov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 16 Transl. into ENGLISH from Pisma v Zh. Tekhnicheskoy Fiz. (USSR), v. 10, no. 13, 12 Jul. 1984 p 816-820 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

An effect associated with the transmission of laser beams through nonlinear media is described in which the scattered light radiation develops an annular structure: spontaneous diffraction of a train of supershort load pulses in a weakly absorbing medium. The structure of the scattered radiation remains annular as the transmission intensity distribution in the laser beam is varied. The

spontaneous diffraction of supershort light pulses is of fundamental importance for understanding the nature of the formation of annular scattering structure during the transmission of light through weakly absorbing media. Scattering of light with spontaneous diffraction of light pulse trains may be one of the mechanisms underlying the restriction of the brightness of mode locked lasers. Author

N85-20812# Joint Publications Research Service, Arlington, Va.
FOUR-WAVE HYPERSONIC REVERSING MIRRORS IN SATURATED MODE Abstract Only c71
N. F. Andreyev, V. I. Bespalov, M. A. Dvoretskiy, and G. A. Pasmanik *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 17 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1476-1479 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

Wave front conjugation based on four wave interaction of light with hypersound was investigated in which the seed source for the development of instability is either the optical signal subjected to wave front conjugation, or spontaneous scattering of the pumping wave on thermal noise of the medium. The low thermal noise level makes it possible to transform the pumping wave energy efficiently through an inverted wave when the input signal is relatively weak. Signals with energy of 0.0001 J were subjected to wave front conjugation by pumping pulses with energy of 5 J and duration of 30 nsec, with conversion of 1 J to the reversed wave and reduction of the pulse duration to 10 nsec. Author

N85-20813# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF PIEZOCERAMIC OPTICAL DEFLECTOR Abstract Only c74
A. M. Shirokov, A. M. Leonov, and V. V. Shulyak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 18 Transl. into ENGLISH from Dokl. Akad. Nauk BSSR (USSR), v. 28, no. 8, Aug. 1984 p 709-712 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The optimum geometric parameters of a trapezoidal piezoceramic deflector were defined with respect to the maximum speed criterion. The deflector consisted of a cantilevered piezo drive with a mirror secured to its free end. The geometric parameters to be optimized were the length and thickness of the drive, as well as the distance along the axis from the end of the drive to the center of gravity of the mirror. It was found that the coefficient characterizing the speed of the deflector increased by 24% when the reflectivity was changed from 0 to 0.5. The main factor underlying the increase in deflector speed is increased thickness of the piezo drive at its attachment point. Author

N85-20814# Joint Publications Research Service, Arlington, Va.
NUMERICAL ANALYSIS OF THERMONUCLEAR DETONATION IN DENSE PLASMA Abstract Only c75
Ye. N. Avronin, A. A. Bunatyan, A. D. Gadzhiyev, K. A. Mustafin, A. Sh. Nurbakov, V. N. Pisarev, L. P. Feoktistov, V. D. Frolov, and L. I. Shibarshov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 19-20 Transl. into ENGLISH from Fizika Plazmy (USSR), v. 10, no. 3, May-Jun. 1984 p 514-521 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The propagation of thermonuclear combustion from the region heated to thermonuclear temperatures by an external source to the remaining part of the target was investigated. The target was a tube of inert material (gold, lead, beryllium, etc.) filled with a deuterium-tritium mixture. It was determined analytically that thermonuclear combustion can propagate from a small portion of a nonspherical target to the remainder of the target and that a steady-state thermonuclear detonation wave can be formed. The role of various physical processes in thermonuclear detonation was investigated. Shock wave is the main mechanism underlying detonation propagation. The detonation rate and intensity of the thermonuclear reaction is influenced by the leakage of heat due to transvere heat conductivity. The critical diameter for thermonuclear detonation was determined approximately for a plasma filament encased in a housing with twice the density of the fuel. Author

N85-20815# Joint Publications Research Service, Arlington, Va.
PLASMA STATES NEAR SURFACE OF METAL IRRADIATED BY CO2 LASER Abstract Only c75
Ye. V. Danshchikov, F. V. Lebedev, and A. V. Ryazanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 20 Transl. into ENGLISH from Fizika Plazmy (USSR), v. 10, no. 2, Mar.-Apr. 1984 p 385-391 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The conditions for the occurrence and maintenance of plasma in different states, and the influence of a plasma on the transmission of laser radiation to the targets, were investigated. The plasma was created by quasi-steady radiation from a CO2 laser producing fixed power of 0.5 to 10 kW for periods of 0.5 to 1 msec focused on the surface of a titanium target in a spot 0.6 mm in diameter. Qualitatively different states of the plasma near the surface were identified from the plasma radiation spectra. The discharge plasma in metal vapors can increase the amount of laser power absorbed by the target, while an optical discharge in gas has a negative influence on the local action of the laser radiation on the target. The state diagrams obtained for the plasma near the surface are helpful for selecting modes and predicting processing conditions. Author

N85-20816# Joint Publications Research Service, Arlington, Va.
EXCITATION OF IMPURITIES BY HEAVY PARTICLES AND RADIATIVE LOSSES OF THERMONUCLEAR PLASMA Abstract Only c75
V. A. Abramov, V. G. Gontis, and V. S. Lisitsa *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 21 Transl. into ENGLISH from Fizika Plazmy (USSR), v. 10, no. 2, Mar.-Apr. 1984 p 400-406 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The role of excitation of impurities by heavy particles and their contribution to thermonuclear plasma radiative losses were analyzed. Excitation losses of multiply-charged impurity ions in a hot plasma was found to be a new direct heavy particle energy loss channel. The radiant energy losses due to excitation by heavy particles in a strong nonequilibrium plasma was found to be comparable with the corresponding electron losses. The effects observed can influence the energy balance of the fundamental plasma ions as well as fast particles (alpha-particles, or particles injected into the plasma to heat it). The absolute losses are determined to a significant extent by the excitation cross sections. The effects observed can play an important role in any plasma system in which the ion temperature is significantly higher than the electron temperature. Author

N85-20817# Joint Publications Research Service, Arlington, Va.
EXPLOSIVE INSTABILITY OF STRONG ELECTROMAGNETIC WAVE IN PLASMA Abstract Only c75
Ye. A. Dubinina, N. A. Urusova, and S. M. Faynshteyn *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 21 Transl. into ENGLISH from Izv. Vysshikh Uchebnykh Zavedeniy: Radiofizika (USSR), v. 27, no. 6, Jun. 1984 p 697-704 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

An earlier work analyzed the possibility of development of explosive instability in a cold plasma in an HF field of a circularly polarized electromagnetic wave. Conditions of development and stabilization of the explosion were determined. For ultrarelativistic strong pumping, the movement of ions must be considered and the study of the generation of the wave upon development of explosive instability in a magnetically active plasma is of interest. The influence of both of these factors is discussed. Dispersion equations were obtained and analyzed from small oscillations, as well as equations for wave amplitudes. The possibility of development of explosive instability was determined and estimates of the explosion times for a laser plasma were obtained. Author

N85-20818# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SHOCK WAVE FRONT ON NATURE OF LUMINESCENCE OF RECOMBINING LASER PLASMA Abstract Only **c75**
V. A. Boyko, B. A. Bryunetkin, F. V. Bunkin, V. I. Derzhnev, V. M. Dyakin, S. A. Mayorov, I. Yu. Skobelev, A. Ya. Fayenov, A. I. Fedosimov, K. A. Shilov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 22 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1332-1337 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

Space-time and spectral measurements were made of the radiation characteristics of a laser plasma interacting with a flat screen. The space-time measurements were used to construct the directivity pattern of the velocities of movement of the fastest component of the plasma, to find the rate of movement of the main mass of the plasma filament, to determine the rate at which the shock wave withdraws from the screen, and to estimate the propagation velocity of the electron heating tongue. It was found through direct observation that the intensity of the continuous spectrum increases somewhat in the zone of conductive heating, where recombination pumping (and, accordingly, ion line luminescence) occur. It was found that the radiation characteristics of a laser plasma interacting with a solid state obstacle is determined by the structure of the shock wave front in the plasma. The fact that recombination population of levels intensifies in the shock wave density discontinuity can be used to amplify radiation on multiply-charged ion transitions. Author

N85-20819# Joint Publications Research Service, Arlington, Va.
STABILITY OF VISCOELASTIC CONSTRUCTIONS SUBJECTED TO STEADY RANDOM COMPRESSING LOADS Abstract Only **c39**
V. D. Potapov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 23 Transl. into ENGLISH from Izv. Akademii Nauk SSSR: Mekhanika Tverdogo Tela (USSR), no. 3, May-Jun. 1984 p 152-159 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

The method of averaging was employed to analyze the stability of stochastic viscoelastic constructions. The integrodifferential equations describing the shift of the construction was converted to differential equation form by the averaging procedure. The analysis indicated that increasing the dispersion of the random component of the load and reducing its correlation scale reduces the degree of stability, while increasing the creep of the material and reducing the relaxation time increases the degree of stability. Increasing the constant component and the dispersion of the random component and reducing the correlation scale of the load reduces the mathematical expectation and dispersion of the time t*, while increasing the creep and the parameter gamma increases these characteristics. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-20787# Joint Publications Research Service, Arlington, Va.
PROBLEM OF FREQUENCY SPACE VARIATION OF SONIC FIELD IN STRATIFIED MEDIA Abstract Only
G. K. Ivanova *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 1 Transl. into ENGLISH from Akusticheskiy Zh. (USSR), v. 30, no. 4, Jul.-Aug. 1984 p 490-494 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20788# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF PRESSURE ON SPEED OF SOUND IN SINGLE-PHASE REGION OF STRATIFYING MIXTURES Abstract Only
A. S. Baklagin, S. P. Dmitriyev, and V. V. Sokolov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 1 Transl. into ENGLISH from Izv. Vysshiki Ucheb. Zaved., Fizika (USSR), v. 27, no. 6, Jun. 1984 p 120-121 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20789# Joint Publications Research Service, Arlington, Va.
GENERATION OF SOUND BY A VORTEX POINT IN A STEADY FLOW OF SLIGHTLY COMPRESSIBLE FLUID Abstract Only
S. G. Kasova and N. N. Andreyev *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 2 Transl. into ENGLISH from Akusticheskiy Zh. (USSR), v. 30, no. 4, Jul.-Aug. 1984 p 502-506 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20812# Joint Publications Research Service, Arlington, Va.
FOUR-WAVE HYPERSONIC REVERSING MIRRORS IN SATURATED MODE Abstract Only
N. F. Andreyev, V. I. Bespalov, M. A. Dvoretskiy, and G. A. Pasmanik *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 17 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1476-1479 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-20820# Brookhaven National Lab., Upton, N. Y.
LOW ENERGY ANTIPROTON INTERACTION STUDIES AT BROOKHAVEN
M. Sakitt, V. Ashford, M. E. Sainio, J. F. Skelly, R. Debbe (Case Western Reserve Univ.), W. Fickinger (Case Western Reserve Univ.), R. Marino (Case Western Reserve Univ.), and D. K. Robinson (Case Western Reserve Univ.) 1984 9 p refs Presented at the 7th European Symp. on Antiproton Interactions, Durham, England, 9 Jul. 1984
(Contract DE-AC02-76CH-00016)
(DE85-001228; BNL-35239; CONF-840795-2) Avail: NTIS HC A02/MF A01

Results on antiproton quasielastic scattering on Al, Cu and Pt for two incident momenta 514 and 633 MeV/c are presented. Differential cross sections for these reactions were combined with other published data and analyzed with a nonrelativistic optical model. Absorption cross section results from our experiment are in good agreement with predictions from our optical model fits. Preliminary results are presented from p elastic scattering on hydrogen for the forward angular region in the momentum range from 360 to 652 MeV/c. Small values of the ratio of the real to imaginary part of the forward scattering amplitude in this momentum interval were obtained. DOE

N85-20821# Sandia Labs., Albuquerque, N. Mex.
HIGH POWER PULSED ACCELERATORS WITH POTENTIAL INDUSTRIAL APPLICATIONS
M. T. Buttram and K. R. Prestwich 1984 17 p refs Presented at the 8th Conf. on the Applications of Accelerators in Res. and Industry, Denton, Tex., 12 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001710; SAND-84-1478C; CONF-841117-7) Avail: NTIS HC A02/MF A01

Radiation processing sources fall into two categories, electron beams and nuclear decay products (gamma rays). Applications requiring high average power (> 100 kW), high dose rate, or limited deposition depth are performed with electrons. Typically, the electron sources that are used for radiation processing are either dc accelerators or linacs with peak powers in the 50 to 200 kW regime. Recent advances have made the development of pulsed electron sources in this parameter range attractive as well. Pulsed sources operate with space charge limited cold cathode emission on the microsecond or submicrosecond time scale. As a result, the dose rates are much higher than currently available. A

design for a 10 MV, 100 kW or greater accelerator for large area electron beam irradiation or for bremsstrahlung conversion is described. The design is based on pulse transformers to generate megavolt, microsecond pulses, saturable magnetic core switching to compress to shorter pulse lengths, pulse forming line adder techniques to transform to 10 MV, a magnetically insulated cold cathode diode for electron beam formation. The status of these various technologies is reviewed. DOE

N85-20822# Argonne National Lab., Ill. Materials Science and Technology Div.

K AND L-SHELL CROSS-SECTIONS FOR X-RAY MICROANALYSIS IN AN AEM

Nestor J. Zaluzec Oct. 1984 12 p refs Presented at the Microbeam Analysis Soc. Analytical Electron Microscopy Meeting, Bethelem, Pa., 16-20 Jul. 1984

(Contract W-31-109-eng-38)

(DE85-002733; CONF-840767-8) Avail: NTIS HC A02/MF A01

The topic of ionization cross sections appropriate for application to the analytical electron microscope (AEM) has become a subject of renewed interest in X-ray microanalysis. A set of parameterizations developed for both K and L Shell calculations is presented which overcomes the detrimental aspects of previous formulations and is applicable for elements ranging from oxygen to uranium for accelerating voltages appropriate to the AEM environment. DOE

N85-20823# Los Alamos Scientific Lab., N. Mex.

COMPUTERIZED STUDY OF SEVERAL ELECTROSTATIC, SURFACE-IONIZATION ION-SOURCE CONFIGURATIONS

Silvio J. Balestrini and Burton G. Schuster Aug. 1984 30 p refs

(Contract W-7405-eng-36)

(DE85-001512; LA-10107) Avail: NTIS HC A03/MF A01

A computer based method is presented whereby the optics of electrostatic, surface ionization ion source designs can be analyzed theoretically. The analysis solves for the luminosity and dispersion of a beam of charged particles at the final collimating slit and at locations preceding the slit. The performance of an ion source tested in 1960 and also some newer optical configurations are compared with theory. DOE

N85-20824# George Washington Univ., Washington, D.C. Dept. of Physics.

INVESTIGATIONS OF THE STRUCTURE AND ELECTROMAGNETIC INTERACTIONS OF FEW-BODY SYSTEMS Progress Report, 1 Sep. 1983 - 31 Aug. 1984

E. P. Harper, D. R. Lehman, and F. Prats 26 Sep. 1984 48 p refs

(Contract DE-AS05-79ER-10332)

(DE85-002854; DOE/ER-10332/13) Avail: NTIS HC A03/MF A01

The structure and electromagnetic interactions of few body systems were investigated. The structural properties of the very light nuclei are examined by developing theoretical models that begin from the basic interactions between the constituents and that are solved exactly (numerically), i.e., full three or four body dynamics. Such models are then used in an attempt to understand the details of the strong and electromagnetic interactions of the few nucleon nuclei after the basic underlying reaction mechanisms are understood with simpler models. Examples of specific work proposed are the following: (1) from exact four body dynamics, derive the equations that will permit calculation of the (4)He(YIELDS) (3)He+n and (4)He(YIELDS)d+d asymptotic normalization constants; (2) develop a unified picture of the p + d (YIELDS) (3)He = (GAMMA), p + d (YIELDS) (3)He = (PI) (0), p + d (YIELDS) and inelastic (1(+)(YIELDS)0(0)) form factors for (6)Li with three body ((ALPHA)NN) wave functions; (3) calculate static properties (RMS radius, magnetic moment, and quadrupole moment) of (6)Li with three body wave functions; and (4) develop the theory for the coincidence reactions (6)Li(p,2p)n(ALPHA), (6)Li(e,e'p)n(ALPHA), and (6)Li(e,e'd) (ALPHA). DOE

N85-20825# Brookhaven National Lab., Upton, N. Y.

CROSSING POINT CONDITIONS, QUADRUPOLE GRADIENTS AND DRIFT SPACE LENGTHS

J. Claus 1984 17 p Presented at the Design and Utilization of the Superconducting Super Collider Summer Study, Snowmass, Colo., 23 Jun. - 13 Jul. 1984

(Contract DE-AC02-76CH-00016)

(DE85-003223; BNL-35244; CONF-8406198-22) Avail: NTIS HC A02/MF A01

The values for the BETA's in a crossing point of a superconducting storage ring system tend to be inversally proportional to the peak BETA values elsewhere in the ring with a constant of proportionality that is largely determined by the configuration of driftspaces and quadrupoles in its immediate vicinity. The value of the constant tends to increase faster than quadratically with the distance from the crossing point to the entrance of the first quadrupole and about as K(-3)/(4) with K (K = B prime/Brho), for K values likely to be available at SSC energies. It appears important to build this section as compactly as possible. The characteristics of a number of possible configurations were calculated, and are discussed: some numerical results are represented graphically. These front sections are to be connected to the adjoining arcs via matching sections which match the unavoidable large peak BETA values to the ones that prevail in the arcs. Two specific examples of complete half insertions, consisting of a front section and a matching section are described and their characteristics are tabulated. DOE

N85-20826# Sandia Labs., Albuquerque, N. Mex.

THEORY OF LETHALITY

J. S. Browning 1984 12 p refs Presented at Air Force/Navy Sci. Eng. Symp., Norfolk, Va., 14 Nov. 1984

(Contract DE-AC04-76DP-00789)

(DE85-000457; SAND-84-1995C; CONF-8411106-1) Avail: NTIS HC A02/MF A01

The lethality of advanced weapon concepts is difficult to establish and lethality considerations are secondary, and perhaps even optional, to the thrust of a technology program. It is contended that lethality is, at best, a poorly understood concept, but that a general theory of lethality can be developed which can permit lethality studies to be performed systematically and to produce credible results. A definition of lethality is presented that requires accurate and efficient evaluation of the survivability of the target systems. Methods for evaluating the survivability of a target system are discussed. A life cycle concept of lethality is introduced which may assist management of 6.11 through 6.4 programs. DOE

N85-20827# Sandia Labs., Albuquerque, N. Mex.

THEORETICAL CROSS SECTIONS FOR INNER-SHELL VACANCY PRODUCTION BY HIGH-ENERGY ELECTRONS

James M. Peek 1984 7 p refs Presented at the Workshop on Electron. and Ionic Collision Cross Sect. Needed in the Modeling of Radiation Interations with Matter, Argonne, Ill., 6 Dec. 1984

(Contract DE-AC04-76DP-00789)

(DE84-007346; SAND-84-0407C; CONF-841206-1) Avail: NTIS HC A02/MF A01

The creation of inner shell vacancies can play an important role in the transport of and energy deposition by fast incident particles. Most high energy electron transport models include this phenomenology. A large body of cross section data is available for this purpose, but many gaps remain to be filled by interpolation or extrapolation methods. The use of relativistic Bethe-Born theory for inelastic electron scattering to augment the existing data for inner shell vacancy production is described. The data required to implement this technique were calculated with both a Hartree-Fock and a relativistic Hartree-Fock description used to define the target structure. The resulting cross sections are available for most elements and for most of their orbitals if the valence electrons are excluded. Comparisons of these data with existing experimental and theoretical inner shell ionization information are summarized. DOE

N85-20828# California Univ., Livermore. Lawrence Livermore Lab.
VIBRATIONAL RELAXATION IN H-2 MOLECULES BY WALL COLLISIONS: APPLICATIONS TO NEGATIVE ION SOURCE PROCESSES
A. M. Karo, J. R. Hiskes, and R. J. Hardy (Nebraska Univ., Lincoln) Oct. 1984 24 p refs Presented at the 31st Am. Vacuum Soc. Symp., Reno, Nev., 4-7 Dec. 1984
(Contract W-7405-eng-48)
(DE85-000852; UCRL-90943; CONF-841218-1) Avail: NTIS HC A02/MF A01

Computer molecular dynamics was used to study the de-excitation and re-excitation of vibrationally excited H2 molecules undergoing repeated wall collisions. The initial translational energies range from thermal to 100 eV and the initial vibrational states range from v" = 2 to v" = 12. The average loss of gain of vibrational, rotational, translational, and total molecular energies and the survival rates of the molecules were evaluated. At thermal energies vibrational de-excitation is the predominant process, and a consistent picture emerges of rapid energy redistribution into all the molecular degrees of freedom and a slower rate of loss of total molecular energy to the wall. At higher translational energies (1 to 10 eV) a substantial fraction of the molecules survive with large (v" > 6) vibrational energy. This vibrational population provides a contribution to the total excited vibrational population comparable to that from the fast electron collision process. DOE

N85-20829# California Univ., Livermore. Lawrence Livermore Lab.
FINITE ELEMENT METHOD FOR SOLVING NEUTRON TRANSPORT PROBLEMS
James M. Ferguson and Ann. Greenbaum 21 Mar. 1984 8 p refs Presented at the ANS Topical Meeting on Reactor Phys. and Shielding, Chicago, 17-19 Sep. 1984
(Contract W-7405-eng-48)
(DE85-001075; UCRL-90579; CONF-840901-19) Avail: NTIS HC A02/MF A01

A finite element method is introduced for solving the neutron transport equations. The method falls into the category of Petrov-Galerkin solution, since the trial space differs from the test space. The close relationship between this method and the discrete ordinate method is discussed, and the methods are compared for simple test problems. B.G.

N85-20830# Stanford Linear Accelerator Center, Calif.
NOTES ON THE RF SYSTEM FOR THE SLC POSITRON SOURCE
H. Hoag 17 Oct. 1984 6 p
(Contract DE-AC03-76SF-00515)
(DE85-002628; SU-SLAC-CN-282) Avail: NTIS HC A02/MF A01

The proposed arrangement of accelerator structures, waveguide feeds and klystrons is shown. A 50 MW klystron at 20-30 will provide power for the high-field capture section immediately following the target. About 1 meter downstream of this section there will be a standard girder of four 3.05-meter SLAC constant gradient accelerator sections. These will be powered by a klystron at station 20-3D. Current thinking is that this will also be a 50 MW tube, but 35 MW might well be sufficient. The length of the rectangular waveguide feed to the capture section will be approximately 132 ft, and the attenuation will be about 153 ft, and 1.07 db. In CN-268 dated 6/22/84: Positron Source: First 50 Nanoseconds, it is shown that good positron acceptance requires very high accelerating fields (on the order of 70 MV/m) in the first meter following the target. Various ways of approaching this gradient in a 1-meter section were examined. DOE

N85-20831# Sandia Labs., Albuquerque, N. Mex.
SELF-OPTIMIZED SECTOR (SOS) MODEL OF SELF-CONSISTENT ENERGY LOSS AND SCATTERING FOR AN ELECTRON BEAM PROPAGATING IN AIR
C. N. Vittitoe and R. E. Clark Sep. 1984 28 p refs Prepared in cooperation with Mission Research Corp., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE85-003161; SAND-84-1099) Avail: NTIS HC A02/MF A01

A method is described to extend Self-Optimized Sector (SOS) code capabilities to treat electron beam propagation in air. The addition allows self consistent simulation that includes the effects of air conductivity. Expressions are found for fast computer evaluation of the energy loss and multiple scattering experienced by beam particles during each time step. The fast expressions are limited to the electron parameter range 1.02 < or = to GAMMA 2 < or = to 41. The energy loss is used to drive air ion equations that create an air conductivity. Because air pressures are restricted to > 4 Torr, the conductivity is modeled as a collision dominated plasma. A cutoff energy of 10 keV is imposed. Smaller energy electrons are forced to deposit their kinetic energy within the cell during the current timestep. The ionization energy loss within a cell is shared among the eight corners of the cell to smooth the distribution. DOE

N85-20832# Temple Univ., Philadelphia, Pa. Dept. of Physics.
EXPERIMENTAL INVESTIGATIONS IN PARTICLE PHYSICS AT INTERMEDIATE ENERGIES Progress Report, 1 Dec. 1983 - 30 Nov. 1984
L. B. Auerbach, V. L. Highland, and W. K. McFarlane Aug. 1984 15 p refs
(Contract DE-AC02-76ER-03539)
(DE85-001481; DOE/ER-03539/26; COO-3539-26) Avail: NTIS HC A02/MF A01

The neutrino experiment at LAMPF (No. 764) was set up and data taking has begun. A letter of intent on a larger experiment was submitted. The Crystal Box work has preceeded, with runs on rare muon decays. The pion decay experiments are being prepared. The antiproton work at CERN has ended the data-taking phase and preliminary results showed a significant narrow line in a pion spectrum, which would indicate a new anti p p state. A new data analysis computing facility was set up. Several publications were prepared, including a full article on the pion-beta decay experiment, a charge-exchange cross section result, an antiproton-proton paper and a rare muon decay results. DOE

N85-20833# California Univ., Livermore. Lawrence Livermore Lab.
RADIATIVE ION BEAMS: HOT STELLAR REACTIONS IN THE LABORATORY
R. C. Haight, G. J. Mathews, and R. W. Bauer Sep. 1984 17 p refs Presented at the 8th Conf. on the Application of Accelerators in Res. and Industry, Denton, Tex., 12-14 Nov. 1984
(Contract W-7405-eng-48)
(DE85-001570; UCRL-91600; CONF-841117-9) Avail: NTIS HC 02/MF A01

Beams of O(15) at 30 MeV and Li8 (at 22 MeV) were generated for cross section measurements of proton and alpha-particle capture reactions on unstable species that are important in hot stellar environments. Studies began aimed toward measuring the H1 Be7, B8(GAMMA) cross section. As part of the development work, an attempt was made attempted to remeasure the H2 Be7, B8 cross section with a different technique that pointed out the importance of background Li8. The H2, Li7, Li8, H1 cross section was found to be 155 + - 20 mb at 12.2 + - 1.3 MeV. DOE

N85-20834# California Univ., Livermore. Lawrence Livermore Lab.
HYDROGEN VIBRATIONAL POPULATION DISTRIBUTIONS AND NEGATIVE ION GENERATION IN TANDEM HIGH DENSITY HYDROGEN DISCHARGES
J. R. Hiskes, A. M. Karo, and P. A. Willmann Oct. 1984 17 p refs Presented at the 31st Natl. Vacuum Symp., Reno, Nev., 3 Dec. 1984
(Contract W-7405-eng-48)
(DE85-001207; UCRL-90951; CONF-841218-3) Avail: NTIS HC A02/MF A01

The tandem high density hydrogen negative ion source system is optimized to identify the largest possible ion concentrations and extracted ion currents. The optimization includes varying the length of the second chamber, varying neutral gas and electron

densities, and varying the ratio of atomic to molecular density. Vibrational excitation occurs via high energy electron excitation (E-V process) and H2(+) surface neutralization (s-V process). These processes are considered separately and acting in parallel. The solutions are presented in terms of a dimensional scale factor, R. For a system scale length R = 1 cm, optimum extracted current densities are in the range 50 mA cm to 100 mA/cm sq. A single chamber s-V system with the high energy electron component suppressed can provide larger ion concentrations than a tandem E-V, s-V system. DOE

N85-20835# California Univ., Livermore. Lawrence Livermore Lab.
LOW-ENERGY, HIGH-INTENSITY POSITRON BEAM EXPERIMENTS WITH A LINAC
R. H. Howell, M. J. Fluss, I. J. Rosenberg, and P. Meyer Sep. 1984 18 p refs Presented at the 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12 Nov. 1984
(Contract W-7405-eng-48)
(DE85-001048; UCRL-90935; CONF-841117-11) Avail: NTIS HC A02/MF A01

Previous experiments with positrons from radionuclides demonstrated that positron beams are a rich source of information about the surface condition of solids. The possibility of producing very intense beams at the Lawrence Livermore 100 MeV electron linac was demonstrated and an apparatus was installed that produces a variable energy positron beam at energies between 500 eV and 20 keV with sufficient intensity to perform a variety of new positron experiments. The positron beam is pulsed with 10 ns to 3 microseconds duration at rates up to 1440 pulses per second, with as many as one million positrons available per pulse. Experiments that require either pulsed or steady currents are possible in an ultrahigh vacuum environment. For the first time, two-dimensional angular correlation spectra of the surface positron and positronium annihilation at a single crystal sample obtained for copper. DOE

N85-20836# California Univ., Livermore. Lawrence Livermore Lab.
NOVEL PROBE FOR DETERMINING THE SIZE AND POSITION OF A RELATIVISTIC ELECTRON BEAM
T. J. Orzechowski, H. A. Koehler, W. Edwards, M. Nelson (Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.), and B. Marshall (Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.) 23 Jul. 1984 11 p refs Presented at the SPIE Ann. Tech. Symp., San Diego, Calif., 19 Aug. 1984
(Contract W-7405-eng-48)
(DE85-001044; UCRL-90555; CONF-840872-30) Avail: NTIS HC A02/MF A01

In order to determine the size and position of a relativistic electron beam inside the wiggler magnetic field of a free electron laser (FEL), we have developed a probe which intercepts the electron beam on a high Z target and monitors the resulting bremsstrahlung radiation. The probe is designed to move along the entire three meters of the wiggler. This FEL is designed to operate in the microwave region (2 to 8 mm) and the interaction region is an oversized waveguide with a cross section 3 cm x 9.8 cm. The axial probe moves inside this waveguide. The probe stops the electron beam on a tantalum target and the resulting X-rays are scattered in the forward direction. A scintillator behind the beam stop reacts to the X-rays and emits visible light in the region where the X-rays strike. An array of fiber optics behind the scintillator transmits the visible light to a Reticon camera system which images the visible pattern from the scintillator. Processing the optical image is done by digitizing and storing the image and/or recording the image on video tape. Resolution and performance of this probe is discussed. DOE

N85-20837# Oak Ridge National Lab., Tenn.
CORRELATED 2 ELECTRON EFFECTS IN COLLISIONS OF MULTIPLY CHARGED Au IONS WITH He
S. Datz, C. Bottcher, L. H. Andersen (Aarhus Univ., Denmark), P. Hvelplund (Aarhus Univ., Denmark), and H. Knudsen (Aarhus Univ., Denmark) 1984 15 p refs Presented at the 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12 Nov. 1984
(Contract DE-AC05-84CR-21400)
(DE85-003064; CONF-841117-19) Avail: NTIS HC A02/MF A01

The fate of electrons released in collisions between highly charged Au (q+) ions (20 MeV) and He atoms was studied. It was found that the large transfer ionization (TI) cross section observed can be accounted for by the transfer of two electrons to a highly correlated state on the Au projectile followed by the loss of one electron to the continuum. Auto-ionization lines are also observed, but they are attributable to electron transfer accompanied by core excitation (TE). DOE

N85-20838# Oak Ridge National Lab., Tenn.
TIME DEPENDENT HARTREE-FOCK THEORY OF ION-ATOM COLLISIONS: APPLICATION TO F(9+) + Ne
C. Bottcher 1984 17 p refs Presented at 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12 Nov. 1984
(Contract DE-AC05-84OR-21400)
(DE85-003083; CONF-841117-20) Avail: NTIS HC A02/MF A01

Atomic collisions at intermediate energies are formulated in terms of a time dependent self-consistent field. Numerical problems which arise in applying the formalism to heavy ions and atoms are discussed. Results are presented on charge capture and ionization in F(9+) + Ne collisions. DOE

N85-20839# Pacific Northwest Lab., Richland, Wash.
INNER SHELL CONTRIBUTION TO MULTIPLE IONIZATION IN ION-ATOM COLLISIONS
R. D. DuBois, L. H. Toburen, and S. T. Manson Aug. 1984 15 p refs Presented at Intern. Conf. on X-ray and Inner-Shell Processes in Atmos, Mol. and Solids, Leipzig, West Germany, 20 Aug. 1984 Prepared in cooperation with Georgia State Univ., Atlanta
(Contract DE-AC06-76RL-01830)
(DE85-003107; PNL-SA-12212; CONF-840829-4) Avail: NTIS HC A02/MF A01

Energetic proton impact ionization data for atomic targets is useful in testing the theoretical understanding of atomic collisions. In certain cases, multiple ionization can account for as much as 50% of the total ionization cross section and thus cannot be neglected in modeling the collision process. Multiple target ionization can occur in a variety of ways. In order to fully analyze the collisional process, cross sections for each of these ionization pathways are necessary but, in general, are unavailable. However, in certain cases combining various experimental and theoretical data allows one to obtain some information about channels heretofore unmeasured. A procedure used process is discussed in detail. In some cases, cross sections for the complex multiple ionization be obtained while in others only information about total contributions of specific ionization channels is available. DOE

N85-20840# American Univ., Washington, D. C.
RECENT PROGRESS IN ELECTRON SCATTERING AT SLAC
R. G. Arnold Sep. 1984 9 p refs Presented at Intern. Conf. on Particles and Nuclei, Heidelberg, West Germany, 30 Jul. 1984 Prepared in cooperation with Stanford Linear Accelerator Center, Calif.
(Contract DE-AC03-76SF-00515)
(DE85-002718; SU-SLAC-PUB-3434; CONF-840789-5) Avail: NTIS HC A02/MF A01

A new experiment on ep elastic scattering at large momentum transfer, experiment e136, has recently completed data taking. A new measurement of deep inelastic electron scattering from nuclear targets, experiment e139, has been completed and preliminary results are available. A new program of experiments has begun, called nuclear physics at SLAC (NPAS), that uses a new injector on the SLAC linac to provide high intensity beams in the energy range from 0.5 to 6 GeV. DOE

N85-20841# California Univ., Berkeley. Lawrence Berkeley Lab.
COLLISIONAL PUMPING FOR THE PRODUCTION OF INTENSE

SPIN-POLARIZED, NEUTRAL BEAMS: TARGET CONSIDERATIONS

J. W. Stearns, C. F. Burrell, S. N. Kaplan, R. V. Pyle, L. Ruby, and A. S. Schlachter Oct. 1984 5 p refs Presented at 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985

(Contract DE-AC03-76SF-00098)

(DE85-003459; LBL-18530; CONF-850310-10) Avail: NTIS HC A02/MF A01

A new method for the production of nuclear-spin-polarized ions and atoms is proposed. A fast beam of atoms is pumped to a single spin state by means of successive capture of a spin-polarized electron followed by the loss of an electron, in a highly electron-spin-polarized medium. This process, which is called collisional pumping, is characterized by the transfer of the electron spin to the nucleus through hyperfine interactions whenever the atom is in a neutral state. It is anticipated that fast polarized beams of 1A or more can be produced, with possible applications to accelerators and fusion research. This process can be accomplished by passage of a low-energy (approx. 1 keV/u) H(+) D(+) to the 16th floor, T(+) beam through a polarized atoms/sq cm. The only bound state of a negative hydrogen ion is a singlet state, which provides a selection mechanism by making electron attachment impossible when the projectile and target electrons have the same spin. DOE

N85-20842# Brookhaven National Lab., Upton, N. Y.

APERTURE STUDIES WITH PATRICIA AND RACETRACK ON SIMPLE ATTICES CONTAINING SSC DIPOLES

G. F. Dell, B. Ieemann, and F. Willeke 23 Jun. 1984 6 p refs Presented at Design and Util. of the Superconducting Super Collider Summer Study, Snowmass, Colo., 23 Jun. 1984 Prepared in cooperation with California Univ., Berkeley. Lawrence Berkeley Lab., Fermi National Accelerator Lab., Batavia, Ill., Deutsches Elektronen-Synchrotron, Hamburg

(Contract DE-AC02-76CH00016)

(DE85-004163; BNL-35406; CONF-8406198-25) Avail: NTIS HC A02/MF A01

The PATRICIA and RACETRACK particle tracking programs have been compared by tracking on a simple lattice. The dynamic aperture was found to decrease as the number of passes through the lattice per run increased from 20 to approx. 300, and it remained constant for longer runs. The dynamic apertures found by the two programs are consistent. The dependence of the dynamic aperture on horizontal tune near a decapole resonance was investigated. RACETRACK and PATRICIA showed decreases in the aperture on opposite sides of the resonance. A second set of studies was made with PATRICIA in which the dynamic apertures of lattices consisting of cells of the types used for the Reference Designs Study were determined when random multipole errors of the dipoles were included. The dependence of aperture on the number of cells in the lattice was determined. Finally, a comparison of magnet types suggested for the SSC was made by determining the aperture of lattices containing these magnets. DOE

N85-20843# Texas A&M Univ., College Station. Dept. of Physics.

RENEWAL REQUEST FOR HIGH ENERGY PHYSICS AT TEXAS A AND M UNIVERSITY Annual Progress Report, 1 Jan. - 31 Dec. 1984

R. C. Webb 1984 71 p refs

(Contract DE-AS05-81ER-40039)

(DE85-004469; DOE/ER-40039/9) Avail: NTIS HC A04/MF A01

The experimental high energy physics program at Texas A and M University continues to make progress in carrying out its research programs begun over the past several years. The magnetic monopole research program started in 1982 reached the data taking stage within the last six months. The status of that experiment is presented, and preliminary results of this search are discussed. Secondly, participation in the construction of the forward backward hadron calorimeter systems for the Fermilab CDF project began to show significant progress, following the signing of an experimental agreement in April of this year. The status of chamber construction and plans for the coming year are reported. Lastly, efforts to participate in an international collaboration of search for magnetic monopoles at the new Gran Sasso Laboratory under construction in Italy are reported. DOE

N85-20844# Oak Ridge National Lab., Tenn.

CALCULATIONS PERTAINING TO THE DESIGN OF A PREBUNCHER FOR A 150-MeV ELECTRON LINEAR ACCELERATOR 3. COMPARISONS WITH EXPERIMENTAL DATA

R. G. Alsmiller, Jr., F. S. Alsmiller, and T. A. Lewis Nov. 1984 22 p refs

(Contract DE-AC05-84OR-21400)

(DE85-002866; ORNL/TM-9375) Avail: NTIS HC A02/MF A01

A ballistic model was previously described that included space-charge effects and calculated results were presented of the extent to which a current pulse of electrons (approx. 150 keV kinetic energy, approx. 1 (MU)C of charge, and approx. 15 nsec full width at half maximum) could be bunched, i.e., reduced in width without loss of charge, by passing it through a series of gaps on which time-dependent voltages are applied. A prebuncher system similar to the one considered previously was now constructed, and experimental data on the current at the end of the prebuncher as a function of time were obtained. Here the calculated current as a function of time, obtained using the model developed previsouly, is compared with the experimental data. The calculated and experimental data are in substantial agreement for a variety of electron beam and voltage gap conditions. DOE

N85-20845# Brookhaven National Lab., Upton, N. Y.

ELECTRON STORAGE RING BEAM LIFETIME DEPENDENCE ON PRESSURE AND PUMPING SPEED

H. J. Halama 1984 19 p refs Presented at 31st Natl. Vacuum Symp., Reno, Nev., 3 Dec. 1984

(Contract DE-AC02-76CH-00016)

(DE85-003208; BNL-35401; CONF-841218-6) Avail: NTIS HC A02/MF A01

The beam loss in electron storage rings depends to a large extent on the interaction of the beam with heavier residual gas molecules such as CO, CO2 and A due to Bremsstrahlung and Coulomb scattering. The gas density inside the vacuum chamber is determined by the surface condition of the vacuum chamber which is bombarded by photons (synchrotron radition) generated by circulating electron beams and by the installed pumping. During the spring shutdown the X-ray ring vacuum system was updated and baked out. Residual gas spectra obtained were typical of a well baked out system, i.e., hydrogen constituted approx. 95% of the gas and the average pressure was in the 10(-10) Torr range. During initial operation and composition of desorbed gases was 43% H2, 25% CO and 16% CO2 and CH4. After 3 months of beam conditioning desorption dropped by a factor of 5 and the CO, CO2 and CH4 peaks represented smaller percentage of total desorbed gas. Beam lifetime did not, however, show a corresponding increase. The pumping speed of distributed pumps dropped to zero at ten to the minus ninth power Torr pressure but increased rapidly from approx. 201/s in low 10(-9) as the pressure increased. DOE

N85-20846# Pacific Northwest Lab., Richland, Wash.

COINCIDENCE TECHNIQUES TO STUDY ELECTRON EMISSION IN ION-ATOM COLLISIONS

R. D. DuBois Nov. 1984 15 p refs Presented at 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12 Nov. 1984

(Contract DE-AC06-76RL-01830)

(DE85-003635; PNL-SA-12414; CONF-841117-24) Avail: NTIS HC A02/MF A01

Electron emission as a function of emission angle and electron energy provides a very sensitive probe for testing the theoretical understanding of ion-atom collisions. For fast proton impact on gaseous targets the Born approximation is shown to work. However, for structured particle impact a comparison with theory is more difficult. The experimental observation of the total electron emission is compared with the sum of the theoretical calculations for projectile only, target only, and simultaneous projectile-target

ionization. A set of experiments where the electron emission is recorded in coincidence with the post collision projectile charge state is discussed. The He (+)-Ar is studied for impact energies between 1 and 2 Mev. Coincidences between emitted electrons and stripped projectiles provide information about projectile ionization while information about simultaneous projectile-target ionization is obtained from stripped projectile-target ion coincidences. DOE

N85-20847# Sandia Labs., Albuquerque, N. Mex.
ITS: THE INTEGRATED TIGER SERIES OF COUPLED ELECTRON/PHOTON MONTE CARLO TRANSPORT CODES
J. A. Halbleib and T. A. Mehlhorn Nov. 1984 105 p refs
(Contract DE-AC04-76DP-00789)
(DE85-003719; SAND-84-0573) Avail: NTIS HC A06/MF A01

The Integrated TIGER Series (ITS) is a powerful and user-friendly software package permitting state-of-the-art Monte Carlo solution of linear time-integrated coupled electron/photon radiation transport problems, with or without the presence of macroscopic electric and magnetic fields of arbitrary spatial dependence. The goal was to simultaneously maximize operational simplicity and physical accuracy. Through a machine portable utility that emulates the basic features of the CDC UPDATE processor, the user selects one of eight codes for running on a machine of one of four (at least) major vendors. The ease with which this utility is applied combines with an input scheme based on order-independent descriptive keywords that makes maximum use of defaults and internal error checking to provide experimentalists and theorists alike with a method for the routine but rigorous solution of sophisticated radiation transport problems. Physical rigor is maximized by employing the best available cross sections and sampling distributions, and the most complete physical model for describing the production and transport of the electron/photon cascade from 1.0 GeV down 1.0 keV. DOE

N85-20848# California Univ., Livermore. Lawrence Livermore Lab.
EXPERIMENTS ON ETA COMPARING WIRE-CONDITIONED AND NON-WIRE-CONDITIONED BEAM PROPAGATION
J. C. Clark, E. J. Lauer, D. S. Prono, and K. W. Struve 18 Jan. 1984 37 p refs
(Contract W-7405-eng-48)
(DE85-004451; UCID-20263) Avail: NTIS HC A03/MF A01

Experiments are described which involve beam propagation with the ETA beam during 1982 following accelerator cavity modifications which allows a maximum beam current of up to 8 Ka at the entrance to the propagation tank. A prominent new feature of the propagation in high pressure gas was an enhancement of the net current as the beam propagated. In some cases this enhanced current was nearly double the injected beam current. The strong current enhancement was associated with strong transverse hose motion of the beam. The absence of microwave emissions in the range from 6.6 GHz to 31 GHz this current enhancement is not due to a two-stream instability. DOE

N85-20849# Los Alamos Scientific Lab., N. Mex.
INVESTIGATION OF THE OUTPUT PARAMETERS OF THE PULSED NEUTRON GENERATOR NGI-5
G. I. Kirianov and A. N. Chekhonin 1984 11 p refs Transl. into ENGLISH from Iadernofiz. Metody Analiza Veshchestva (USSR), 1971 p 288-294
(Contract W-7405-eng-36)
(DE85-001823; LA-Tr-84-44) Avail: NTIS HC A02/MF A01

An analysis of the structural scheme of the neutron generator, the processes in the ion source, and the dependence of the output of the neutron flow on various parameters makes it possible to develop small pulsed generators with increased outputs of the neutron flows and to stabilize the output over time. In order to reduce the dimensions of pulsed neutron generators, it is necessary to develop accelerating voltage pulsed generators with accelerating times on the order of 0.1 microseconds which makes it possible to increase the electrical strength and reduce the energy consumed, i.e., to increase the efficiency of the device and reduce its dimensions. DOE

N85-20850# California Univ., Berkeley.
ELECTRON ACCELERATION Progress Report
11 Oct. 1984 38 p refs
(Contract DE-AT03-84ER-40136)
(DE85-002337; DOE/ER-40136/T1) Avail: NTIS HC A03/MF A01

The idea for charged particle acceleration by Gaussian laser beams was analyzed in detail, considering the beam modes best suited for the purpose and taking into account the possibility of using a gas with optimum refraction index. The approach used involved a normalization of both laser beam and electron trajectory parameters which result in computed curves and expressions valid for any beams and trajectories within the assumptions made for the analysis. Various laser modes correspond to different values of constants. The practical usefulness of this type of interaction was evaluated qualitatively for high energy particle production. Only optimized linear trajectories at velocities near the vacuum light velocity are considered. A relationship between particle energy, gas index of refraction, and trajectory angle is derived. This relationship is a generalization of the high energy Cherenkov condition for cumulative interaction with a single plane wave, and it shows that higher gas pressure is needed for laser modes giving larger energy transfer to the electrons. DOE

N85-20851# California Univ., Livermore. Lawrence Livermore Lab.
LOOK AT ENERGY COMPRESSION AS AN ASSIST FOR HIGH POWER RF PRODUCTION
D. L. Birx, Z. D. Parkas, and P. B. Wilson 9 Aug. 1984 30 p refs Presented at US Summer School on High Energy Particle Accelerator, Batavia, Ill., 13 Aug. 1984 Prepared in cooperation with Stanford Linear Accelerator Center, Calif.
(Contract W-7405-eng-48)
(DE85-001568; UCRL-91598; CONF-91598) Avail: NTIS HC A03/MF A01

The desire to construct electron linacs of higher and higher energies, coupled with the realities of available funding and real estate, forced machine designers to reassess the limitations in both accelerator gradient (MeV/m) and energy. The gradients achieved in current radio-frequency (RF) linacs are sometimes set by electrical breakdown in the accelerating structure, but are in most cases determined by the RF power level available to drive the linac. Several energy compression schemes which might be of service in helping to make better use of the sources employed are discussed. Radio Frequency power requirements are discussed. DOE

N85-20852# Pacific Northwest Lab., Richland, Wash.
COINCIDENCE STUDIES OF SECONDARY ELECTRON EMISSION IN LIGHT ION-ATOM COLLISIONS
R. D. DuBois Jul. 1984 29 p refs Presented at the 2nd Workshop on High-Energy Ion-Atom Collision Processes, Debrecen, Hungary, 27-28 Aug. 1984
(Contract DE-AC06-76RL-01830)
(DE85-002373; PNL-SA-12495; CONF-8408110-2) Avail: NTIS HC A03/MF A01

Detailed information about the energy loss mechanism requires knowledge of total cross sections for target ionization as well as electron emission probabilities as a function of electron energy and emission angle. The differential measurements provide stringent tests for theoretical models used to describe the collisional process. However, electron emission spectra are in many cases quite complicated due to the possibilities of electron emission from inner as well as outer shells, multiple electron emission in a single collision, electron emission from the projectile as well as from the target in the case of structured particle impact. To date, most of our knowledge about collisional ionization mechanisms was obtained from analyzing non-coincidence data. In some cases, coincidence measurements have supplemented this data. Some specific experimental work is discussed that demonstrates how

coincidence data can aid in the understanding of ionization mechanisms. In general, the discussion is restricted to high energy proton or helium ion impact on atomic targets where the ionization is observed through the emitted electron spectra. DOE

N85-20853# Oak Ridge National Lab., Tenn.
RECENT ADVANCES IN FORWARD ELECTRON PRODUCTION STUDIES IN ION-ATOM AND ION-SOLID COLLISIONS
I. A. Sellin, S. B. Elston, and S. D. Berry 1984 14 p refs Presented at the 2nd Workshop on High-Energy Ion-Atom Collision Processes, Debrecen, Hungary, 27 Aug. 1984 Prepared in coopertion with Tennessee Univ., Knoxville Sponsored in part by NSF
(Contract DE-AC05-84OR-21400)
(DE85-001255; CONF-8408110-1) Avail: NTIS HC A02/MF A01

The manuscript dwells mainly on very recent progress in the field especially on progress with experimental techniques. The basics are briefly reviewed to provide appropriate orientation for those who may lack acquaintance with the field. DOE

N85-20854# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
CLASSICAL RAINBOW SCATTERING OF ALKALI IONS ON METAL SURFACES. APPLICATION TO THE INVESTIGATION OF UNKNOWN SURFACE STRUCTURES Thesis [KLASSISCHE REGENBOGENSTREUUNG VON ALKAKIIONEN AN METALLOBERFLAECHEN. ANWENDUNG AUF DIE UNTERSUCHUNG UNBEKANNTER OBERFLAECHENSTRUKTUREN]
K.-R. Mann Jun. 1984 180 p refs In GERMAN
(MPIS-10/1984; ISSN-0436-1199) Avail: NTIS HC A09/MF A01

The surface rainbow scattering of K and Li-atoms on tungsten single crystal surfaces was investigated in the superthermal energy domain between 5 and 50 eV. In-plane angular and energy distributions of the scattered particles are determined. The angular distributions show pronounced structures which can be explained by the classical surface rainbow effect. The energy spectra of K show two clearly separated maxima at the failure energies, as expected by the free two-collision model. Classical rainbow scattering provides information on unknown surface structures since the rainbow maxima in the angular distributions of the scattered projectiles are closely related to the evolution of the interaction potential inside the surface unit cell and hence are connected with the geometric arrangement of the surface atoms.
Author (ESA)

N85-20855# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
HYPERFINE STRUCTURE AND LIFETIME MEASUREMENTS ON ELECTRONICALLY EXCITED LONG-LIFE MOLECULES IN A BEAM EXPERIMENT Thesis [HYPERFEINSTRUKTUR- UND LEBENSDAUERMESSUNGEN AN ELEKTRONISCH ANGEREGTEN LANGLEBIGEN MOLEKUELEN IN EINEM STRAHLEXPERIMENT]
D. Neuschaefer Jun. 1984 214 p refs In GERMAN
(MPIS-11/1984; ISSN-0436-1199) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34.70

A large molecular beam apparatus was built to investigate hyperfine structure and lifetime of electronically excited long-life molecules. The apparatus produces intensive beams of electronically excited molecules in long-life states. Beams of N2, CO, NO, H2, Ar, and mixtures were examined. Four detection methods for excited molecules were applied: open multipliers, luminescent collision reaction, spontaneous emission of long-life excited molecules, and laser-induced fluorescence (LIF) of metastable molecules. The first method shows in N2 the presence of several excited beam components, one of which is identified with the second method. With the third method in N2, CO, and NO the beam afterglow is shown to be a very universal method to determine electronically excited molecules. More than 300 lines are excited in metastable H2 by LIF. The apparatus provides a state-specific detector for metastable molecules. Author (ESA)

N85-20856# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
DIRECT MEASUREMENT OF THE TEMPERATURE DEPENDENCE OF THE VELOCITY OF THE REACTION OF DEUTERIUM ATOMS WITH VIBRATION-EXCITED HYDROGEN MOLECULES Thesis [DIREKTE MESSUNG DER TEMPERATURARHAENGIGKEIT DER GESCHWINDIGKEIT DER REAKTION VON DEUTERIUM-ATOMEN MIT SCHWINGUNGSANGEREGTEN WASSERSTOFF-MOLEKUELEN]
U. Wellhausen Jun. 1984 147 p refs In GERMAN
(MPIS-12/1984; ISSN-0436-1199) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25.05

The velocity constants of the reaction between deuterium atoms and vibration-excited hydrogen molecules were investigated. The measurements were performed in a thermostatically controllable flow reactor, coupled with an atomic line resonance absorption detection method. The state-specific velocity constant of the reaction is determined as a function of temperature. The resulting information on the activation energy of the reaction of D-atoms with vibration-excited H allows statements about the efficiency of the vibration energy to overcome the reaction energy barrier, and an insight into the microscopic evolution of the reaction.
Author (ESA)

N85-20200# Joint Publications Research Service, Arlington, Va.
A 10/SUP 11/W HIGH CURRENT PULSE ELECTRON BEAM ACCELERATOR DESCRIBED
Chuanxin Lu, Baozeng Song, guannu Wu, Pizhang Zhou, Chunsheng Zhang, Judi Zhang, Changhe Zhao, Zhongsen Guo, Yongzai Man, and Jingping Lu *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-025) 10 Sep. 1984 p 33-42 refs Transl. into ENGLISH from Hejubian Yu Dengliziti Wuli (China), v. 3, no. 4, 15 Dec. 1983 p 235-240 (For primary document see N85-20197 11-31)
Avail: NTIS HC A05/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-20857*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHARGE-TO-MASS DISPERSION METHODS FOR ABRASION-ABLATION FRAGMENTATION MODELS
Lawrence W. Townsend and John W. Norbury (Old Dominion Univ., Norfolk, Va.) Mar. 1985 9 p refs
(NASA-TM-86340; L-15912; NAS 1.15:86340) Avail: NTIS HC A02/MF A01 CSCL 20H

Methods to describe the charge-to-mass dispersion distributions of projectile prefragments are presented and used to determine individual isotope cross-sections or various elements produced in the fragmentation of relativistic argon nuclei by carbon targets. Although slight improvements in predicted cross-sections are obtained for the quantum mechanical giant dipole resonance (GDR) distribution when compared qith the predictions of the geometric GDR model, the closest agreement between theory and experiment continues to be obtained with the simple hypergeometric distribution, which treats the nucleons in the nucleus as completely uncorrelated. E.A.K.

N85-20858# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
EXPERIMENTAL AND THEORETICAL HIGH ENERGY PHYSICS Progress Report, 1 Jan. - 31 Dec. 1984
1984 48 p refs
(Contract DE-AC02-83ER-40105)
(DE85-000844; DOE/ER-40105/511) Avail: NTIS HC A03/MF A01

Experimental high energy physics was studied. Theoretical study covered: two point functions for confining potentials; duality, moments and Regge trajectories in nonrelativistic quantum mechanics; confined solutions to the massless quantum chromodynamics in 1+1 dimensions; phenomenology of supersymmetry; theories with broken supergravity and grand unification near the Planck scale; proton decay in nonminimal conventional GUTS; chiral symmetry and vector meson dominance; radiative decay of hyperons; KNO scaling and its violation; Schwinger model in the new wave equation formalism; nonperturbative nonrenormalization theorem for supersymmetric QCD; compositeness scale; positive and neutral pion mass difference at finite temperature; standard model without Higgs mechanism; nonstandard fermion mass matrices and nucleon decay; plasmon effects leading to possible strong coupling behavior in high temperature gauge theories; nucleon decay vs. baryogenesis in supersymmetric inflationary cosmologies; and properties of a fermion bound to a GUT monopole. B.G.

N85-20859# Sandia Labs., Albuquerque, N. Mex.
WESF (173)Cs GAMMA RAY SOURCES
B. T. Kenna Oct. 1984 75 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000676; SAND-82-1492) Avail: NTIS HC A04/MF A01

The Waste Encapsulation and Storage Facility (WESP) at Hanford, Washington has been separating cesium from stored liquid defense waste since 1945. This is done to alleviate the heat generated by the decay of radioactive Cs137. The cesium is converted to CsCl, doubly encapsulated in 316l stainless steel, and placed in storage. The potential utility of these Cs137 capsules as gamma radiation sources was demonstrated. Registration of the capsule with the NRC as a sealed gamma source would facilitate the licensing of non-DOE irradiation facilities using this source. To grant this registration, the NRC requires characteristics of the capsule. It must also be demonstrated that the capsule will maintain its integrity under both normal circumstances and specified abnormal conditions. The required information is provided through collation of results of studies and tests done previously by other laboratories. DOE

N85-20860# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF HOST-ROCK DISSOLUTION AND PRECIPITATION ON PERMEABILITY IN A NUCLEAR WASTE REPOSITORY IN TUFF
J. W. Braithwaite and F. B. Nimick Sep. 1984 57 p refs
(Contract DE-AC04-76DP-00789)
(DE85-000675; SAND-84-0192) Avail: NTIS HC A04/MF A01

Thermally induced, host-rock mineral dissolution and precipitation processes were studied to determine if they could decrease the isolation capability of a potential high-level nuclear waste repository in tuff by significantly altering the permeability of the formation. Porosity changes were calculated as a function of time, depth, emplaced waste power density, and water flux for both matrix and fracture flow. Cumulative porosity changes were shown to be very small, and net decreases in porosity were shown to occur only in the vicinity of the repository horizon if the groundwater vaporizes. The differences in permeability for both matrix and fracture flow resulting from these small cumulative porosity were shown to occur only in the vicinity of the repository horizon if the groundwater vaporizes. The differences in permeability for both matrix and fracture flow resulting from these small cumulative porosity changes should have no significant effect on the overall hydrologic patterns at the site at Yucca Mountain, Nevada. DOE

N85-20861# Argonne National Lab., Ill.
RADIOACTIVE WASTE ISOLATION IN SALT: PEER REVIEW OF THE D'APPOLONIA REPORT ON SCHEMATIC DESIGNS FOR PENETRATION SEALS FOR A REPOSITORY IN THE PERMIAN BASIN, TEXAS
D. F. Hambley, J. C. Stormont, J. E. Russell, D. E. Edgar, D. F. Fenster, W. Harrison, and M. W. Tisue Sep. 1984 38 p refs
(Contract W-31-109-eng-38)
(DE85-000693; ANL/EES-TM-262) Avail: NTIS HC A03/MF A01

The results are presented for a peer review critiquing a report on schematic designs for penetration seals for a radioactive waste repository. The following technical issues are considered: (1) excluding salt from shaft sealing concepts; (2) keys for bulkheads; (3) borehole seal designs; (4) cementitious materials; (5) stratigraphy; and (6) sealing schedule and retrievability. R.S.F.

N85-20862# Los Alamos Scientific Lab., N. Mex. Advanced Energy Conversions Systems.
OPENING UP THE FUTURE IN SPACE WITH NUCLEAR POWER
D. Buden and J. Angelo, Jr. (Florida Inst. of Technology, Melbourne) 1985 22 p refs Presented at the 2nd Symp. on Space Nucl. Power Systems, Albuquerque, N. Mex.
(Contract W-7405-eng-36)
(DE85-002411; LA-UR-84-3388; CONF-850103-2) Avail: NTIS HC A02/MF A01

Man's extraterrestrial development is dependent on abundant power. For example, space based manufacturing facilities are projected to have a power demand of 300 kWe by the end of this century, and several megawatts in the early part of next millenium. The development of the lunar resource base will result in power needs ranging from an initial 100 kW(e) to many megawatts. Human visits to Mars could be achieved using a multimegawatt nuclear electric propulsion system or high thrust nuclear rockets. Detailed exploration of the solar system will also be greatly enhanced by the availability of large nuclear electric propulsion systems. All of these activities will require substantial increases in space power - hundreds of kilowatts to many megawatts. The use of nuclear energy to support humanity's expansion into space is explained and applications are given. DOE

N85-20863# Pacific Northwest Lab., Richland, Wash.
FIELD LYSIMETER FACILITY FOR EVALUATING THE PERFORMANCE OF COMMERCIAL SOLIDIFIED LOW-LEVEL WATER
M. B. Walter, M. J. Graham, and G. W. Gee Nov. 1984 46 p refs
(Contract DE-AC06-76RL-01830)
(DE85-003886; PNL-5253) Avail: NTIS HC A03/MF A01

Analyzing the potential migration of radionuclides from sites containing solid low-level wastes requires knowledge of contaminant concentrations in the soil solution surrounding the waste. This soil solution concentration is generally referred to as the source term and is determined by such factors as the concentration of radionuclides in the solid waste, the rate of leachate formation, the concentration of dissolved species in the leachate, any solubility reactions occurring when the leachate contacts the soil, and the rate of water flow in the soil surrounding the waste. A field lysimeter facility established at the Hanford site is being used to determine typical source terms in arid climates for commercial low-level wastes solidifed with cement, Dow polymer (vinyl ester-styrene), and bitumen. The field lysimeter facility consists of 10, 3-m-deep by 1.8-m-dia closed-bottom lysimeters situated around a 4-m-deep by 4-m-dia central instrument caisson. Commercial cement and Dow polymer waste samples were removed from 210-L drums and placed in 8 of the lysimeters. Two bitumen samples are planned to be emplaced in the facility's remaining 2 lysimeters during 1984. Author

N85-20864# Los Alamos Scientific Lab., N. Mex.
SPACE NUCLEAR-POWER REACTOR DESIGN BASED ON COMBINED NEUTRONIC AND THERMAL-FLUID ANALYSES
1985 36 p refs Presented at 2nd Symp. on Space Nucl. Power Systems, Albuquerque, N. Mex., 14 Jan. 1985
(Contract W-7405-eng-36)
(DE85-002433; LA-UR-84-3440; CONF-850103-3) Avail: NTIS HC A03/MF A01

The design and performance analysis of a space nuclear-power system requires sophisticated analytical capabilities such as those developed during the nuclear rocket propulsion (Rover) program. Optimizing the size of a space nuclear reactor for a given power level requires satisfying the conflicting requirements of nuclear

criticality and heat removal. The optimization involves the determination of the coolant void (volume) fraction for which the reactor diameter is a minimum and temperature and structural limits are satisfied. A minimum exists because the critical diameter increases with increasing void fraction, whereas the reactor diameter needed to remove a specified power decreases with void fraction. An analytical capability is described and demonstrated for the determination of minimum reactor size. The analysis is based on combining neutronic criticality calculations with OPTION-code thermal-fluid calculations. DOE

N85-20865# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
HIGH-LEVEL WASTE PROCESSING AND DISPOSAL
J. L. Crandall, H. Drause, C. Sombret, and K. Uematsu 1984 35 p Presented at Joint Meeting of the Am. Nucl. Soc. and the Atomic Ind. Forum, Washington, D.C., 11 Nov. 1984 Prepared in cooperation with Kernforschungszentrum Karlsruhe, West Germany, CEA, Marcoule, France, Power Reactor and Nuclear Fuel Development Corp., Tokyo
(Contract DE-AC09-76SR-00001)
(DE85-003564; DP-MS-84-86; CONF-841105-48) Avail: NTIS HC A03/MF A01

The national high level waste disposal plans for France, the Federal Republic of Germany, Japan, and the United States are covered. Three conclusions are reached. The first conclusion is that an excellent technology already exists for high level waste disposal. With appropriate packaging, spent fuel seems to be an acceptable waste form. Borosilicate glass reprocessing waste forms are well understood, in production in France, and scheduled for production in the next few years in a number of other countries. For final disposal, a number of candidate geological repository sites have been identified and several demonstration sites opened. The second conclusion is that adequate financing and a legal basis for waste disposal are in place in most countries. Costs of high level waste disposal will probably and about 5 to 10% to the costs of nuclear electric power. Third conclusion is less optimistic. DOE

N85-20866# National Inst. voor Kernfysica en Hoge Energieysica, Amsterdam (Netherlands).
[ACTIVITIES IN NUCLEAR PHYSICS AND HIGH ENERGY PHYSICS] Annual Report, Jul. 1983 - Jun. 1984
1984 102 p refs
Avail: NTIS HC A06/MF A01

Electron scattering; the physics of pions, muons and antiprotons; theoretical physics; radio and nuclear chemistry; and technical developments in nuclear and high energy physics are summarized. Author (ESA)

N85-20208# Joint Publications Research Service, Arlington, Va.
THERMIONIC CONVERTER FOR SPACE REACTOR DESCRIBED
Shengquan Cao and Jicai Yang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 60-69 refs Transl. into ENGLISH from He Kexue Yu Gongcheng (China), v. 4, no. 3, Sep. 1984 p 227-232 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

74 OPTICS

Includes light phenomena.

N85-20867*# National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENT OF THE CONFIGURATION OF A CONCAVE SURFACE BY THE INTERFERENCE OF REFLECTED LIGHT
Tetsuo Kumazawa, Tatsuji Sakamoto, and Shigeru Shida Feb. 1985 18 p refs Transl. into ENGLISH from J. of the Japan Soc. of Precision Eng., (Japan), v. 50, no. 2, 1984 p 66-70 Presented at Precision Instr. Acad. Spring Sci. Lecture Meeting, 22 Mar. 1982 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original document prepared by Hitachi Ltd., Japan (Contract NASw-4004)
(NASA-TM-77796; NAS 1.15:77796) Avail: NTIS HC A02/MF A01 CSCL 20F

A method whereby a concave surface is irradiated with coherent light and the resulting interference fringes yield information on the concave surface is described. This method can be applied to a surface which satisfies the following conditions: (1) the concave face has a mirror surface; (2) the profile of the face is expressed by a mathematical function with a point of inflection. In this interferometry, multilight waves reflected from the concave surface interfere and make fringes wherever the reflected light propagates. Interference fringe orders. Photographs of the fringe patterns for a uniformly loaded thin silicon plate clamped at the edge are shown experimentally. The experimental and the theoretical values of the maximum optical path difference show good agreement. This simple method can be applied to obtain accurate information on concave surfaces. E.A.K.

N85-20868*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WIDE-ANGLE FLAT FIELD TELESCOPE Patent Application
Kenneth L. Hallam, Barton J. Howell, and Mark E. Wilson, inventors (to NASA) Filed 5 Feb. 1985 16 p
(NASA-Case-GSC-12825-1; NAS 1.71:GSC-12825-1; US-Patent-Appl-SN-698641) Avail: NTIS HC A02/MF A01 CSCL 20F

An unobscured three mirror wide-angle telescopic imaging system comprised of an input baffle which provides a 20 deg. (Y axis) x 301 deg. (X axis) field of view, a primary mirror having a convex spherical surface, a secondary mirror having a concave ellipsoidal reflecting surface, and a tertiary mirror having a concave spherical reflecting surface. The mirrors comprise mirror elements which are offset segments of parent mirrors whose axes and vertices commonly lie on the system's optical axis. An iris diaphragm forming an aperture stop is located between the secondary and tertiary mirror with its center also being coincident with the optical axis and being further located at the beam waist of input light beams reflected from the primary and secondary mirror surfaces. At the system focus, following the tertiary mirror, is located a flat detector which may be, for example, a TV imaging tube or a photographic film. When desirable, a spectral transmission filter is placed in front of the detector in close proximity thereto. NASA

N85-20869# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Physics and Engineering Physics.
SURFACE PHYSICS INSTRUMENTATION Final Scientific Report, 15 Aug. 1983 - 14 Aug. 1984
M. Seidl, G. Tompa, and W. Carr 26 Oct. 1984 26 p
(Grant AF-AFOSR-0316-83)
(AD-A149304; AFOSR-84-1164TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

A surface physics instrumentation system was assembled using components purchased from the DOD Instrumentation Grant in addition to components already present in the laboratory. The system consists of the following parts: Ultrahigh vacuum vacuum system with sample insertion, Auger electron spectrometer, Ion scattering spectrometer, Secondary ion mass spectrometer and work function measuring system. The instrument is a basic tool for preparing and analyzing well defined surfaces in UHV environment. GRA

N85-20870# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optical Div.
DIFFRACTION-LIMITED IMAGING OF SPACE OBJECTS 2 Annual Scientific Report, 1 Mar. 1983 - 29 Feb. 1984
J. R. Fienup Oct. 1984 95 p
(Contract F49620-82-K-0018)
(AD-A149344; ERIM-161900-13-T; AFOSR-84-1171TR) Avail: NTIS HC A05/MF A01 CSCL 17/8

This report describes the results of the second year of a

three-year research program to investigate methods for obtaining diffraction-limited images of space objects, despite the turbulent atmosphere, by reconstructing images from data provided by optical interferometers (particularly stellar speckle interferometry). Accomplishments include the following: (1) Improved image reconstruction algorithms were developed. (2) A better understanding of modes of stagnation of algorithms was developed. (3) The performance of the shift-and-add image formation method and of one recursive algorithm were investigated. (4) A second recursive algorithm was shown to suffer from a uniqueness problem. (5) A potential new remote sensing application of the iterative reconstruction algorithm was explored. (Author). GRA

N85-20871# Aerodyne Research, Inc., Billerica, Mass.
OPTICAL EIGENVECTOR Final Report, Mar. 1982 - Mar. 1984
J. Caulfield Oct. 1984 147 p
(Contract F19628-82-C-0068)
(AD-A149550; ARI-RR-393; RADC-TR-84-208) Avail: NTIS HC A07/MF A01 CSCL 20/6

At the beginning of this contract, both we and the rest of the optical community imagined that simple analog optical computers could produce satisfactory solutions to eigen problems. Early in this contract we improved optical computing conceptually and tested it experimentally. This demonstrated that high accuracy required digital optics. This led us to explore digital optical systolic array processors. Here we made sufficient progress to guaranteee that the original contract goal (the use of optics for fast, accurate eigen solution) is now perfectly practical and to show that the hoped-for advantages in size, cost, and power consumption relative to equally fast electronic computers should be obtained.
Author (GRA)

N85-20872# Department of the Air Force, Washington, D.C.
DOUBLE PINHOLE SPATIAL PHASE CORRELATOR APPARATUS Patent Application
P. R. Peterson, inventor (to Air Force) Filed 7 Dec. 1984 12 p
(AD-D011495; US-Patent-Appl-SN-679333) Avail: NTIS HC A02/MF A01 CSCL 20/6

A random wavefront is incident on an aperture plate with a double pinhole of variable separation that is followed by Fourier transforming optics which focuses an intensity profile on a detector array. The detector array is located in the Fourier transform plane of the Fourier transform lens. The time average of the intensity as a function of hole separation yields the root mean square phase and the phase correlation function of the applied wavefront.
Author (GRA)

N85-20873# Clarke Ambrose, Inc., Knoxville, Tenn.
LIGHTING FOR REMOTE VIEWING SYSTEMS
J. V. Draper 1984 5 p refs Presented at the DOE/ORNL Natl. Topical Meeting on Robotics and Remote Handling in Hostile Environ., Tokyo, 24 Jul. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001898; CONF-840793-6) Avail: NTIS HC A02/MF A01

Scenes viewed by television do not provide the same channels of information for judgment of distances as scenes viewed directly, since television eliminates or degrades several depth perception cues. However, it may be possible to improve depth perception of televised scenes by enhancing the information available through depth cues that are available from lighting. A literature survey and expert opinions were integrated to design a remote lighting arrangement which could enhance depth perception of operators performing remote handling operations. The lighting arrangement is described and some of its advantages and disadvantages are discussed. DOE

N85-20874# National Bureau of Standards, Washington, D.C. Center for Building Technology.
EVALUATION OF INFRARED REFLECTANCE AS A TECHNIQUE FOR MEASURING ABSORBER MATERIALS DEGRADATION
D. Waksman and W. E. Roberts Sep. 1984 45 p refs
(Contract DE-AI01-76PR-06010)
(DE85-002171; NBSIR-84-2916) Avail: NTIS HC A03/MF A01

Current ASTM standards concerned with the durability and reliability of adsorptive coatings rely on integrated solar absorptance and emittance as the primary methods for assessing changes in absorber optical performance resulting from environmental exposure. Infrared reflectance measurements were assessed to determine if they are a more sensitive technique for detecting absorber materials degradation. Sepectral measurements were made to identify factors that could affect the reproducibility of infrared reflectance measurements and to compare their ability to detect changes with currently used methods for absorber materials. Recommendations are made concerning the use and limitations of infrared reflectance measurements for this purpose. DOE

N85-20875# California Univ., Berkeley. Lawrence Berkeley Lab.
ULTRAVIOLET DIVERGENCES AND SUPERSYMMETRIC THEORIES
Augusto Sagnotti Sep. 1984 23 p refs Presented at a Lecture on Enrico Fermi, Varenna, Italy, 18 Jun. 1984
(Contract DE-AC03-76SF-00098)
(DE85-001649; LBL-18406; CONF-8406212-2) Avail: NTIS HC A02/MF A01

The improved ultraviolet properties of supersymmetric theories were dealt with. A survey of the state of the art as of August, 1984, and a somewhat more detailed discussion of the breakdown of the superspace power-counting beyond $N = 2$ superfields are presented. A method is also described for simplifying divergence calculations that uses the locality of subtracted Feynman integrals. DOE

N85-20876# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
POLARIZATION TRANSFORMATION BY SINGLE-MODE FIBERS
Guenther Garlichs Feb. 1984 104 p refs In GERMAN; ENGLISH summary
(FI-452-TBr-59) Avail: NTIS HC A06/MF A01

Birefringence of single-mode fibers and the induced polarization transformation is theoretically investigated. An equivalent arrangement, consisting of a linear and circular retarder, describes the fiber birefringence. Assuming a homogenous linear birefringence, straight, uniformly curved, constantly twisted, and both twisted and curved fibers are investigated. Statements not constrained to special birefringence parameters are possible by normalization. The function of polarization maintaining fibers is treated. The wavelength dependence of fiber birefringence and the influence of fiber technology are not considered. Methods for measuring the quantities of the equivalent arrangement and the linear retardance per unit length are indicated. Author (ESA)

N85-20175# Joint Publications Research Service, Arlington, Va.
SIEMENS-CORNING PLANT TO MANUFACTURE OPTICAL FIBERS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 1-2 Transl. into ENGLISH from Handelsblatt (Dusseldorf), 4 Dec. 1984 p 12 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

N85-20218# Joint Publications Research Service, Arlington, Va.
DESIGN AND ANALYSIS OF AIRBORNE SCANNING OPTICAL SYSTEMS Abstract Only
Tieming Wang *In its* China Rept.: Sci. and Technol. (JPRS-CST-84-039) 3 Dec. 1984 p 146 Transl. into ENGLISH from Hongwai Yanjiu (China), v. 3, no. 3, 1984 p 199-208 (For primary document see N85-20206 11-31)
Avail: NTIS HC A08/MF A01

N85-20798# Joint Publications Research Service, Arlington, Va.
STUDY OF LIGHT SHIFTS IN LASER PUMPED QUANTUM DISCRIMINATOR FREQUENCY Abstract Only
L. A. Budkin, M. N. Penenkov, A. I. Pukhtelev, and S. L. Puzanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 8 Transl. into ENGLISH from Izv. Vyssikh Uchebnykh

Zavedenity, Radiofizika (USSR), v. 27, no. 6, Jun. 1984 p 705-708 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20799# Joint Publications Research Service, Arlington, Va.
SOLID STATE LUMINESCENT LIGHT FILTERS FOR NEODYMIUM LASERS Abstract Only
V. N. Verenik, V. G. Koptev, T. M. Razvina, M. B. Rzhevskiy, A. A. Stavrov, and G. P. Starostina *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 8 Transl. into ENGLISH from Zh. Prikldnoy Spektroskopii (USSR), v. 61, no. 1, Jul. 1984 p 43-48 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20811# Joint Publications Research Service, Arlington, Va.
SPONTANEOUS DIFFRACTION OF SEQUENCE OF SUPERSHORT LIGHT PULSES IN DYE SOLUTION Abstract Only
G. B. Altshuler, N. R. Belashenkov, V. B. Karasev, and S. A. Kozlov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 16 Transl. into ENGLISH from Pisma v Zh. Tekhnicheskoy Fiz. (USSR), v. 10, no. 13, 12 Jul. 1984 p 816-820 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20813# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF PIEZOCERAMIC OPTICAL DEFLECTOR Abstract Only
A. M. Shirokov, A. M. Leonov, and V. V. Shulyak *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 18 Transl. into ENGLISH from Dokl. Akad. Nauk BSSR (USSR), v. 28, no. 8, Aug. 1984 p 709-712 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-20877 Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
A PROPOSED METHOD FOR FAST DETERMINATION OF PLASMA PARAMETERS
B. Braams (FOM Instituut voor Plasmaphysica, Jutphaas, Netherlands) and K. Lackner Sep. 1984 19 p refs Sponsored by Euratom and Netherlands Organization for the Advancement of Pure Research
(IPP-1/228) Copyright. Avail: Issuing Activity

The method of function parametrization is proposed for data evaluation in controlled fusion research. The method uses statistical analysis of a data base of simulated experiments to obtain a functional representation of the intrinsic physical parameters of a system in terms of the values of the measurements. In Tokamak experiments it could determine parameters characterizing the current profile, shape of the cross section, plasma pressure, and the internal inductance. Measurements for this application include values of the poloidal field and flux external to the plasma, and a diamagnetic measurement. These may be combined with other diagnostics, such as electron-cyclotron emission and laser interferometry, to obtain density and temperature profiles. On-line determination of basic physical parameters, on a millisecond timescale on a minicomputer appears possible. Author (ESA)

N85-20878 Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
NORMAL MODE ANALYSIS FOR LINEAR RESISTIVE MAGNETOHYDRODYNAMICS
W. Kerner, K. Lerbinger, R. Gruber (Ecole Polytechnique Federal de Lausanne), and T. Tsunematsu (Tokai Research Establishment, Japan) Oct. 1984 58 p refs
(IPP-6/235) Copyright. Avail: Issuing Activity

The compressible, resistive MHD equations are linearized around an equilibrium with cylindrical symmetry and solved numerically as a complex eigenvalue problem. This normal mode code enables resistivities as small as 10 to the minus 10 th power to be solved. The scaling of growth rates and layer width agrees very well with analytical theory. The influence of current and pressure on the instabilities is studied. The effect of resistivity on the ideally unstable internal kink is analysed. Author (ESA)

N85-20879# Florida Univ., Gainesville. Dept. of Physics.
ION QUADRUPOLE EFFECTS IN SPECTRAL LINE BROADENING
R. F. Joyce and C. F. Hooper, Jr. 1984 17 p refs Presented at the 7th Intern. Conf. on Spectral Line Shapes, Aussois, France, 11 Jun. 1984
(Contract DE-AS08-81DP-40159)
(DE85-001504; CONF-8406153-2) Avail: NTIS HC A02/MF A01

Line broadening is currently being used as a diagnostic tool for density determination in dense plasmas. The applicability of this tool could be improved through better understanding of line shifts and asymmetries. Most calculable line shape theories to date employ the dipole approximation to treat the interaction between the radiator and perturbing ions. That is, the interaction is given by vector P.vector E, where vector P is the emitter dipole moment and vector E is a uniform quasistatic microfield due to the perturbing ions. It was proposed that the next higher multipole in the radiator perturbing ion interaction, that is the quadrupole field gradient interaction, could be a significant source of asymmetry. A method to include the quadrupole interaction in line broadening theories and discuss some preliminary calculations is presented. DOE

N85-20880# Rochester Univ., N. Y. Lab. for Laser Energetics.
CORONAL SPECTROSCOPY IN LASER PLASMAS
L. M. Goldman, R. Bahr, R. Boni, B. Boswell, R. S. Craxton, J. Delettrez, R. L. McCrory, W. Seka, R. W. Short, and K. Tanaka 29 Oct. 1984 12 p Presented at the Meeting of the Plasma Phys. Div. of the Am. Physical Soc., Boston, 27 Oct. 1984
(Contract DE-AC08-80DP-40124)
(DE85-002817; DOE/DP-40124/71; CONF-841010-4) Avail: NTIS HC A02/MF A01

An overview of spectrally resolved electromagnetic emission from laser plasmas produced by irradiating solid targets at 351 nm and 1053 nm is presented. The spectra are indicative of a large number of parametric processes occurring in the corona between 0.05n/sub c/ and n/sub c/. The data were taken in support of laser fusion experiments carried out at the Laboratory for Laser Energetics. DOE

N85-20881# California Univ., Livermore. Lawrence Livermore Lab.
TMX-U NEUTRAL PRESSURE MEASUREMENT DIAGNOSTIC SYSTEMS
W. L. Pickles, S. L. Allen, D. N. Hill, A. L. Hunt, and T. C. Simonen 14 Sep. 1984 16 p refs Presented at the 5th Topical Conf. on High Temp. Plasma Diagn., Lake Tahoe, Nev., 16 Sep. 1984
(Contract W-7405-eng-48)
(DE85-000746; UCRL-91504; CONF-8409157-3) Avail: NTIS HC A02/MF A01

The tandem mirror experiment-upgrade (TMX-U) has a large and complex system of Baird Alpert, magnetron, and Penning gauges, in addition to mass spectrometers (RGA), all of which measure neutral pressures in the many internal regions of TMX-U. These pressure measurements are used as part of the confinement physics data base as well as for management of the TMX-U vacuum system. Dynamic pressures are modeled by a coupled-volumes simulation code, which includes wall reflux, getter pumping, and plasma pumping. DOE

N85-20882# Oak Ridge National Lab., Tenn.
ATOMIC PROCESSES INVOLVING IMPURITIES IN THE PLASMA EDGE
R. A. Phaneuf 1984 25 p refs

(Contract DE-AC05-84OR-21400)
(DE85-001277; DOE/OR-21400/T48) Avail: NTIS HC A02/MF A01

A brief overview and bibliography are given of collisional processes involving common plasma impurities which play important roles in the edge or scrape-off plasma region of magnetically-confined fusion devices. An assessment is given of the status of the existing atomic-collision data base, of current and proposed data needs, and of forthcoming developments which are likely to augment this data base during the next few years. DOE

N85-20883# Grumman Aerospace Corp., Princeton, N.J.
MONTE CARLO STUDIES OF TANDEM MIRROR PLASMAS INTERACTING WITH WAVES IN THE ION CYCLOTRON RANGE OF FREQUENCIES (ICRF) Progress Report, 1 Jul. - 30 Sep. 1984
A. M. M. Todd Oct. 1984 18 p refs
(Contract DE-AC02-82ER-53140)
(DE85-002988; DOE/ER-53140/16) Avail: NTIS HC A02/MF A01

A wave propagation and antenna code for tandem mirrors which includes axial parameter variation was considered. Although the basic code has been written, there remain problems of boundary condition formulation. A study of neutral beam deposition in PBX has been slowed by persistent problems that appear to be system related. DOE

N85-20884# Oak Ridge National Lab., Tenn.
FUSION ENERGY DIVISION Annual Progress Report, period ending 31 Dec. 1983
Sep. 1984 414 p refs
(Contract DE-AC05-84OR-21400)
(DE85-001701; ORNL-6015) Avail: NTIS HC A18/MF A01

Progress in fusion energy is reported. The work includes: (1) experimental and theoretical research on two magnetic confinement concepts; the ELMO Bumpy Torus (EBT) and the Tokamak; (2) theoretical and engineering studies on a third concept, the stellarator; (3) engineering and physics of present generation fusion devices; (4) development and testing of diagnostic tools and techniques; (5) development and testing of materials for fusion devices; (6) development and testing of essential technologies for heating and fueling fusion plasmas; (7) development and testing of the superconducting magnets that will be needed to confine these plasmas; (8) design of future devices; (9) assessment of the environmental impact on fusion energy; and (10) assembly and distribution to the fusion community of data bases on atomic physics and radiation effects. DOE

N85-20885# Sandia Labs., Albuquerque, N. Mex.
LASER-PLASMA INTERACTIONS FOR THE DEPOSITION AND ETCHING OF SEMICONDUCTOR MATERIALS
P. J. Hargis, Jr. and J. M. Gee 1984 25 p refs Presented at the 9th Ann. Plasma Seminar, Palo Alto, Calif., 21 May 1984
(Contract DE-AC04-76DP-00789)
(DE85-000458; SAND-84-1926C; CONF-8405251-1) Avail: NTIS HC A02/MF A01

Laser plasma chemical processing is a versatile materials processing technique in which an ultraviolet laser and a glow discharge are both required in order for deposition or etching to occur on semiconductor substrates. This new materials processing technique was used to both deposit and etch semiconductor materials on a number of substrates. Recent results have demonstrated that laser plasma chemical processing can also be used to deposit epitaxial silicon films on single crystal silicon wafers. Laser Raman spectroscopy, transmission electron microscopy, and scanning electron microscopy were used to characterize the deposited and etched films. Results obtained to date were interpreted in terms of a mechanism which involves the interaction of the incident ultraviolet laser radiation with a plasma deposited adlayer on the irradiated substrate. DOE

N85-20886# California Univ., Los Angeles. Dept. of Physics.
ROLE OF CAVITONS IN LASER-PLASMA INTERACTIONS Final Report, 1 Aug. 1983 - 14 Aug. 1984
A. Y. Wong, T. Tanikawa, and P. Y. Cheung Jul. 1984 19 p refs
(Contract DE-AS08-83DP-40187)
(DE85-001842; DOE/DP-40187/1) Avail: NTIS HC A02/MF A01

The trapping of electron plasma waves inside a caviton has been observed after the termination of the driving fields in a one dimensional inhomogeneous plasma. The observed characteristics of trapped waves verify quantitatively the predictions of the Zakharov equations. The existence of trapped eigenmodes in the caviton was demonstrated experimentally using a novel two frequency excitation technique. The interaction of these eigenmodes among themselves causes the plasma to emit electromagnetic radiations in strong turbulent state. Preliminary results of microwave plasma interaction and scaling of caviton fields with the plasma density are also presented. DOE

N85-20887# Oak Ridge National Lab., Tenn. Physics Div.
FIR INTERFEROMETER/POLARIMETER SYSTEM ON ISX-B TOKAMAK
C. H. Ma, D. P. Hutchinson, P. A. Staats, and K. L. VanderSluis 1984 11 p refs Presented at the 5th APS Topical Conf. on High Temp. Plasma Diagnostics, Tahoe City, Calif., 16-20 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-001129; CONF-840922-5) Avail: NTIS HC A02/MF A01

Recent results of simultaneous measurements of electron density and Faraday rotation on all five channels of the FIR interferometer/polarimeter system on ISX-B are presented. The time resolution of the interferometer is typically 1 micron. The standard deviation of the output of the interferometer of a constant phase shift is less than 5 x 10(-2) fringe, corresponding to a line electron density of 5 x 10(11) cm (-3). The polarimeter shows a sensitivity of the order of one milliradian and a time resolution of approximately 1 msec. Data are reported on ohmic- as well as neutral-beam-heated plasmas including solid hydrogen pellete injections. It is believed that this is the first successful measurement of Faraday rotation in pellet-injected discharges. Data analysis codes were developed and the results are compared with other measurements. DOE

N85-20888# California Univ., Livermore. Lawrence Livermore Lab. Mirror Fusion Div.
MIRROR FUSION PROGRESS Progress Report, Jul. - Dec. 1983
M. A. Harrison, ed. and C. Gerich, ed. 11 Apr. 1984 60 p refs
(Contract W-7405-eng-48)
(DE85-001187; UCRL-50051-83-3/4) Avail: NTIS HC A04/MF A01

The primary topics addressed are: (1) confinement systems; (2) development and technology; (3) applied plasma physics; and (4) mirror fusion test facility. Each main section is introduced by an overall statement of goals and objectives. These are followed by articles detailing significant recent activities, introduced by very brief summary statements. DOE

N85-20889# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
CONTROL OF SURFACE COMPOSITION AND HYDROGEN RECYCLING BY PLASMA CONDITIONING
R. E. Clausing and L. Heatherly 29 May 1984 22 p refs Presented at the 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14 May 1984
(Contract DE-AC05-84OR-21400)
(DE85-001859; CONF-840520-21) Avail: NTIS HC A02/MF A01

Data from a laboratory simulator, TEXTOR, JET, and other Tokamaks are used to show that oxygen and carbon surface impurities on the walls of plasma chambers are interrelated and can be manipulated by controlling the composition of the gas used for plasma surface conditioning. Not only can oxygen be reduced to low levels but carbon (and other elements) can be either removed or deposited and reacted with the substrates. In the case of carbon deposits, a thin metal-carbide layer can be

formed or thicker deposits of elemental carbon can be made. Surface compositions can be reproduced easily and reversibly in a controlled way. Furthermore, these composition changes can alter the hydrogen recycling speed and plasma impurity levels by an order of magnitude or more. In the simulator gas composition is related to surface composition changes and resulting recycling behavior. Surface oxygen levels can be reduced from 30 to less than 3 at. % in less than 45 min of discharge cleaning. Carbon and oxygen levels as well as those of other surface active impurities are interrelated. Examples are shown and discussed. Comparisons are made to show the changes in the hydrogen recycling behavior caused by various surface preparations (compositions). DOE

N85-20890# Texas Univ., Austin.
DRIVEN GLOBAL ALFVEN EIGENMODES
M. E. Oakes, R. D. Bengtson, W. D. Booth, T. E. Evans, S. M. Mahajan, D. W. Ross, P. M. Valanju, X. Z. Wang, and C. M. Surko (AT and T Bell Labs., Murray Hill, N.J.) 1984 5 p refs Presented at the Intern. Conf. on Plasma Phys., Lausanne, Switzerland, 27 Jun. 1984
(Contract DE-AS05-77ET-53042)
(DE85-001056; CONF-840616-22) Avail: NTIS HC A02/MF A01

The low frequency spectrum ((Omega less than Omega) sub ci) of Alfven waves in inhomogeneous plasmas with shear reveal, in addition to the continuum, the existence of global eigenmodes, whose macroscopic structure depends on the linear coupling of the shear and compressional modes (via gradients of the equilibrium current or gradients of the finite frequency corrections). The presence of these modes in a Tokamak plasma was detected by observing resonance in the resistance of driven poloidal antennas. The Pretext Tokamak was studied using two-phased toroidal antennas, in which global eigenmodes were observed at the theoretically predicted plasma parameter combinations. In addition, their radial and poloidal structure were determined with a CO2 laser interferometer. The results of the laser study are reported elsewhere. The impedance measurements done in conjunction with the laser work are reviewed herein. DOE

N85-20891# California Univ., Berkeley.
COVARIANT LIE-TRANSFORMED PLASMA ACTION PRINCIPLE
A. N. Kaufman 23 Jul. 1984 7 p refs Presented at NRL-NSWC Workshop on Local and Global Methods of Dyn., Silver Spring, Md., 23 Jul. 1984
(Contract DE-AC03-76SF-00098)
(DE85-000285; LBL-18314; CONF-840794-3) Avail: NTIS HC A02/MF A01

The Lie transform is a systematic technique to obtain the nonlinear quasistatic effects of high frequency phenomena. A plasma of charged particles in a self-consistent electromagnetic wave was considered. Each particle oscillates about an oscillation center which undergoes nonoscillatory motion. The ponderomotive Hamiltonian for the oscillation center is obtained in relativistically covariant form, and, via the action principle it is demonstrated that it determines the dielectric susceptibility and wave propagation. DOE

N85-20892# Oak Ridge National Lab., Tenn.
MAGNETIC FLUCTUATIONS, FIELD REVERSAL MAINTENANCE, AND ANOMALOUS THERMAL TRANSPORT IN THE REVERSED FIELD PINCH
P. H. Diamond, Z. G. An, M. N. Rosenbluth, B. A. Carreras, T. C. Hender, and J. A. Holmes Nov. 1984 18 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003804; ORNL/TM-9306) Avail: NTIS HC A02/MF A01

A theory of magnetic fluctuations, field reversal maintenance (dynamo activity), and anomalous thermal transport in the Reversed Field Pinch is proposed. Nonlinear generation of and coupling to m greater than or equal to 2 modes is advanced as an m = 1 tearing mode saturation mechanism. The mechanism by which nonlinear m = 1 tearing modes sustain the toroidal magnetic field is elucidated. The predicted fluctuation levels and scalings are consistent with those required for maintaining the B sub z configuration. Heat transport is estimated using stochastic magnetic field diffusion arguments. DOE

N85-20893# California Inst. of Tech., Pasadena.
FLUCTUATIONS AND TRANSPORT IN FUSION PLASMAS Annual Progress Report, 1 Oct. 1983 - 30 Sep. 1984
R. W. Gould 1984 5 p
(Contract DE-FG03-84ER-53173)
(DE85-003612; DOE/ER-53173/T1) Avail: NTIS HC A02/MF A01

This grant supports an integrated program of experiment and theory in Tokamak plasma physics. Emphasis is placed on microscopic fluctuations and anomalous transport. The primary objective is to characterize the properties of the microscopic fluctuations observed in Tokamaks and to try to develop an understanding of the fluctuation-induced transport of particles and heat. Anomalous transport, which causes energy losses one to two orders of magnitude larger than predicted by neoclassical transport theory, occurs in all Tokamaks and underlies empirical scaling laws. DOE

N85-20894# Oak Ridge National Lab., Tenn.
NUMERICAL MODEL FOR SWIRL COOLING IN HIGH-HEAT-FLUX PARTICLE BEAM TARGETS AND THE DESIGN OF A SWIRL-FLOW-BASED PLASMA LIMITER
S. L. Milora, S. K. Combs, and C. A. Foster Nov. 1984 22 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003824; ORNL/TM-9183) Avail: NTIS HC A02/MF A01

An unsteady, two-dimensional heat conduction code was used to study the performance of swirl-flow-based neutral particle beam targets. The model includes the effects of two-phase heat transfer and asymmetric heating of tubular elements. The calorimeter subjected to 30-s neutral beam pulses with incident heat flux intensities of greater than or equal to 5 kW/cu cm, is modeled. The numerical results indicate that local heat fluxes in excess of 7 kW/sq cm occur at the water cooled surface on the side exposed to the beam. This exceeds critical heat flux limits for uniformly heated tubes with straight flow by approximately a factor of 5. The design of a plasma limiter based on swirl flow heat transfer is presented. DOE

N85-20895# Oak Ridge National Lab., Tenn.
OBSERVATIONS OF LOW FREQUENCY PLASMA FLUCTUATIONS IN ELMC BUMPY TORUS
A. Komori Oct. 1984 55 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003796; ORNL/TM-7906) Avail: NTIS HC A04/MF A01

In the ELMO Bumpy Torus (EBT) plasma, two types of low frequency fluctuations were identified in the frequencies range of dc up to 1 MHz: a drift-type fluctuation and an interchange instability. The latter, which leads to an unstable toroidal plasma, is prominently excited in the outer plasma along the hot electron ring. In the proper neutral pressure regime, the hot electron rings prevent these two fluctuations from growing and permit the establishment of a stable toroidal plasma. DOE

N85-20896# Hawaii Univ., Honolulu. Dept. of Physics and Astronomy.
DESIGN, CONSTRUCTION AND INITIAL EVALUATION OF AN ABSOLUTE, TIME-INTEGRATING/TIME-RESOLVING SPECTROMETER FOR THE DIAGNOSTICS OF PULSED, HIGH TEMPERATURE PLASMA X-RAY SOURCES IN THE 100-10,000 EV REGION
B. L. Henke Oct. 1984 142 p refs
(Contract DE-AS08-82DP-40175)
(DE85-003526; DOE/DP-40175/1) Avail: NTIS HC A07/MF A01

A new spectrograph system was developed and calibrated for the absolute spectrometry of high intensity pulsed X-ray sources in the 100 to 10,000 eV region. This spectral region is analyzed with fixed elliptically curved crystals and molecular multilayers of 2d-values in the 3 to 160 A range. Twin channels are utilized for

simultaneous time-integrated photographic recording and for time-resolved X-ray streak camera recording. Absolute calibrations of the elliptical analyzers, of the photographic film, and of the gold and CsI transmission photocathodes were made using monoenergetic, CW laboratory X-ray sources. The overall transmission characteristics of the spectrograph were determined. The instrument is designed for mounting through a pneumatically-controlled high-vacuum valve onto a 4 inch port of a meter diameter source chamber and includes an appendace, high-vacuum, sputter-ion prepumping station. DOE

N85-20897# California Univ., Livermore. Lawrence Livermore Lab.
X-RAY SPECTROSCOPY OF LASER-PRODUCED PLASMAS
Robert L. Kauffman Aug. 1984 6 p refs Presented at the 8th Intern. Colloquim on EUV and X-ray Spectroscopy of Astrophysical and Lab. Plasmas, Washington, 27-29 Aug. 1984
(Contract W-7405-eng-48)
(DE85-002170; UCRL-91411; CONF-8408124-1) Avail: NTIS HC A02/MF A01

A brief discussion is given of the importance of X-ray spectroscopy as a diagnostic tool for laser-produced plasma. Of particular note is the role of opacity and time dependence. DOE

N85-20898# Oak Ridge National Lab., Tenn.
THEORY OF RESISTIVITY-GRADIENT-DRIVEN TURBULENCE
L. Garcia, B. A. Carreras, P. H. Diamond (Texas Univ., Austin), and J. D. Callen (Wisconsin Univ., Madison) Oct. 1984 59 p refs
(Contract DE-AC05-84OR-21400; Grant DE-FG05-80ET-53088)
(DE85-002175; DOE/ET-53088/146; IFSR-146) Avail: NTIS HC A04/MF A01

A theory of the nonlinear evolution and saturation of resistivity-driven turbulence, which evolves from linear rippling instabilities, is presented. The nonlinear saturation mechanism is identified both analytically and numerically. Saturation occurs when the turbulent diffusion of the resistivity is large enough so that dissipation due to parallel electro thermal conduction balances the nonlinearity modified resistivity gradient driving term. The levels of potential, resistivity, and density fluctuations at saturation are calculated. A combination of computational modeling and analytic treatment is used in this investigation. DOE

N85-20899# Illinois Univ., Urbana. School of Chemical Sciences.
THETA PINCH DISCHARGES FOR SOLIDS VAPORIZATION AND ELEMENTAL CHEMICAL ANALYSIS Technical Progress Report
1984 4 p
(Contract DE-FG02-84ER-13218)
(DE85-002968; DOE/ER-13218/2) Avail: NTIS HC A02/MF A01

A theta pinch discharge for sampling and excitation of solids for elemental analysis is examined. Spectral data were collected. The sample used to explore pinch behavior was Al alloy 2024; argon or helium was used as fill gas. The magnetic compress coil was redesigned. Experiments were conducted on the pinch light emission and the preionizer current. Primary goal remains the generation of a sufficiently hot, dense plasma to vaporize high-melting materials. DOE

N85-20900# Oak Ridge National Lab., Tenn.
CONVERGENT SPECTRAL REPRESENTATION FOR 3-DIMENSIONAL INVERSE MBD EQUILIBRIA
S. P. Hirshman and H. Weitzner (New York Univ., N.Y.) Oct. 1984 18 p refs
(Contract DE-AC05-84OR-21400)
(DE85-000866; ORNL/TM-9302) Avail: NTIS HC A02/MF A01

By rearranging terms in a polar representation for the cylindrical spatial coordinates (R, theta, Z), a renormalized Fourier series moment expansion is obtained that possesses superior convergence properties in mode number space. This convergent spectral representation also determines a unique poloidal angle and thus resolves the underdetermined structure of previous moment expansions. A conformal mapping technique is used to demonstrate the existence and uniqueness of the new representation. DOE

N85-20901# Oak Ridge National Lab., Tenn. Fusion Energy Div.
TRANSIENT WAVEFORM ACQUISITION SYSTEM FOR THE ELMO BUMPY TORUS
K. G. Yong, R. D. Burris, D. R. Hillis, and D. R. Overbey Oct. 1984 56 p refs
(Contract DE-AC05-84OR-21400)
(DE85-000154; ORNL/TM-9201) Avail: NTIS HC A04/MF A01

The transient waveform system described in this report is designed to acquire analog waveforms from the ELMO Bumpy Torus (FBT) diagnostic experiments. Pressure, density, synchrotron radiation, etc., are acquired and digitized with a Kinetic Systems TR812 transient recorder and associated modules located in a CAMAC crate. The system can simultaneously acquire, display, and transmit sets of data consisting of identification parameters and up to 1024 data points for 1 to 64 input signals (frequency range = 0.01 pulse/s to 100 kHz) of data every one or more minutes; thus, it can run continuously without operator intervention. The data are taken on a VAX 11/780 and transmitted to a data base on a DECSystem-10. To aid the programmer in making future modifications to the system, detailed documentation using the Yourdon structural methods has been given. DOE

N85-20902# California Univ., Livermore. Lawrence Livermore Lab.
EDGE DIAGNOSTICS FOR TANDEM MIRROR MACHINES
S. L. Allen 14 Sep. 1984 28 p refs
(Contract W-7405-eng-48)
(DE85-001209; UCRL-91500; CONF-8409157-4) Avail: NTIS HC A03/MF A01

The edge plasma in a tandem mirror machine shields the plasma core from cold neutral gas and impurities. A variety of diagnostics are used to measure the fueling, shielding, and confinement of the edge plasma in both the end plug and central cell regions. Fast ion gauges and residual gas analyzers measure the gas pressure and composition outside of the plasma. An array of Langmuir probes is used to measure the electron density and temperature. Extreme ultraviolet (euv) and visible spectroscopy are used to measure both the impurity and deuterium densities and to estimate the shielding factor for the core plasma. The linear geometry of a tandem mirror also allows direct measurements of the edge plasma by sampling the ions and electrons lost but the ends of the machine. Representative data obtained by these diagnostics during operation of the tandem mirror experiment (TMX) and tandem mirror experiment-upgrade (TMX-U) experiments are presented. Diagnostics currently developed for diagnosis of the edge plasma are also discussed. DOE

N85-20903# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
[ACTIVITIES REPORT OF THE INSTITUTE OF PLASMA RESEARCH] Annual Report, 1983 [FORSCHUNGSBEREICHT 1983]
1983 22 p refs In GERMAN
Avail: NTIS HC A02/MF A01

The electron cyclotron heating (ECRH) program on the WVII-A stellarator; energy supply and control systems of a 28GHz/200kW gyrotron; and transmission line components are discussed. The systems were successfully tested on WVII-A in mixed mode operation and with polarized wave radiation. Wave propagation calculations were made for ECRH on the WVII-AS stellarator. Far infrared laser scattering diagnostics in lower hybrid heating on the Tokamak ASDEX; and use of lidar Thomson scattering on the JET Tokamak were examined. Laser scattering experiments were conducted on the plasma focus POSEIDON. A four-fluid description of the plasma focus, including microinstabilities was developed. Author (ESA)

N85-20904# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

LIGHT DIFFRACTION WITH COLLECTIVE, THERMAL ELECTRON DENSITY FLUCTUATION IN PLASMAS WITH SEVERAL IONIC COMPONENTS [LICHTSTREUUNG AN KOLLEKTIVEN, THERMISCHEN FLUKTUATIONEN DER ELEKTRONENDICHTE IN PLASMEN MIT MEHREREN IONENKOMPONENTEN]
Walter Kasparek Aug. 1984 103 p refs In GERMAN; ENGLISH summary
(IPF-84-5) Avail: NTIS HC A06/MF A01

The thermal ion feature in plasmas containing two ion components was measured with high spectral resolution using scattering from collective electron density fluctuations together with coherent detection. With a local oscillator power of 0,3 W, the system reached a shot-noise limited NEP of 5 times 10 to the minus 19th power W/Hz. The plasma source is a magnetically stabilized hydrogen arc. The effect of a second ion component on the hydrogen spectrum was investigated at scattering angles of 95 and 175 mrad. Starting with a pure hydrogen plasma, other gases with different mass number up to 40 were added to simulate the effects of heavy impurities. Ion temperatures and densities and the effective charge were determined. The damping of ion acoustic resonances in hydrogen due to the heavy ions is observed. The narrowing of the spectra was used to measure the direction of the magnetic field in a laboratory plasma. Author (ESA)

N85-20814# Joint Publications Research Service, Arlington, Va.
NUMERICAL ANALYSIS OF THERMONUCLEAR DETONATION IN DENSE PLASMA Abstract Only
Ye. N. Avronin, A. A. Bunatyan, A. D. Gadzhiyev, K. A. Mustafin, A. Sh. Nurbakov, V. N. Pisarev, L. P. Feoktistov, V. D. Frolov, and L. I. Shibarshov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 19-20 Transl. into ENGLISH from Fizika Plazmy (USSR), v. 10, no. 3, May-Jun. 1984 p 514-521 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20815# Joint Publications Research Service, Arlington, Va.
PLASMA STATES NEAR SURFACE OF METAL IRRADIATED BY CO2 LASER Abstract Only
Ye. V. Danshchikov, F. V. Lebedev, and A. V. Ryazanov *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 20 Transl. into ENGLISH from Fizika Plazmy (USSR), v. 10, no. 2, Mar.-Apr. 1984 p 385-391 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20816# Joint Publications Research Service, Arlington, Va.
EXCITATION OF IMPURITIES BY HEAVY PARTICLES AND RADIATIVE LOSSES OF THERMONUCLEAR PLASMA Abstract Only
V. A. Abramov, V. G. Gontis, and V. S. Lisitsa *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 21 Transl. into ENGLISH from Fizika Plazmy (USSR), v. 10, no. 2, Mar.-Apr. 1984 p 400-406 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20817# Joint Publications Research Service, Arlington, Va.
EXPLOSIVE INSTABILITY OF STRONG ELECTROMAGNETIC WAVE IN PLASMA Abstract Only
Ye. A. Dubinina, N. A. Urusova, and S. M. Faynshteyn *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 21 Transl. into ENGLISH from Izv. Vysshikh Uchebnykh Zavedeniy: Radiofizika (USSR), v. 27, no. 6, Jun. 1984 p 697-704 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20818# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SHOCK WAVE FRONT ON NATURE OF LUMINESCENCE OF RECOMBINING LASER PLASMA Abstract Only
V. A. Boyko, B. A. Bryunetkin, F. V. Bunkin, V. I. Derzhnev, V. M. Dyakin, S. A. Mayorov, I. Yu. Skobelev, A. Ya. Fayenov, A. I. Fedosimov, K. A. Shilov et al *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-85-001) 9 Jan. 1985 p 22 Transl. into ENGLISH from Kvantovaya Elektronika (USSR), v. 11, no. 7, Jul. 1984 p 1332-1337 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-20905*# National Aeronautics and Space Administration, Washington, D. C.
DETERMINATION OF THE MOBILITY PROFILE IN GaAs-MESFETS Thesis
W. Prost Mar. 1985 90 p Transl. into ENGLISH of "Bestimmung des Beweglichkeitsprofils in GaAs-MESFETs" Jun. 1983 120 p Transl. by Corporate Word, Pittsburgh Original document prepared by Duisberg Univ., West Germany
(Contract NASw-4006)
(NASA-TM-77818; NAS 1.15:77818) Avail: NTIS HC A05/MF A01 CSCL 20L

A process for measuring charge carrier mobility for gallium-arsenide metal semiconductor field effect transistors is described in an attempt to optimize the relationship between this factor and production. The measuring procedure allows an actual determination of local mobility in the channel. The physical basis for the process and features of the measuring room are outlined. The measuring technique is described and recommendations are made for setting measuring parameters. E.A.K.

N85-20906*# National Aeronautics and Space Administration. Pasadena Office, Calif.
LOW STRESS SEMICONDUCTOR-INSULATOR INTERFACE FOR CRYOGENIC DEVICE APPLICATIONS Patent Application
Greg Sherrill (JPL, California Inst. of Tech., Pasadena) and Robert J. Mattauch, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 10 Jan. 1985 8 p
(Contract NAS7-100)
(NASA-Case-NPO-16394-1; NAS 1.71:NPO-16394-1; US-Patent-Appl-SN-690284) Avail: NTIS HC A02/MF A01 CSCL 20L

The problem of GaAs device degradation at cryogenic temperatures at the interface of a GaAs device layer and openings in an overlying SiO2 passivation layer is addressed. This problem is solved by providing a semi-insulating GaAs passivation layer epitaxially grown on the underlying GaAs device layer. This structure provides a lattice-matched passivation layer not subject to severe mechanical stress at cryogenic temperatures. NASA

N85-20907# Argonne National Lab., Ill. Materials Science and Technology Div.
STABILITY OF SUPERCONDUCTING COMPOSITES IN A MAGNETIC FIELD
K. E. Gray Sep. 1984 5 p refs Presented at the 10th Intern. Conf. on Cryogenic Eng., Espoo, Finland, 31 Jul. - 3 Aug. 1984
(Contract W-31-109-eng-38)
(DE85-002731; CONF-840705-5) Avail: NTIS HC A02/MF A01

The calculation of the stability criterion for superconducting films in zero field is extended to finite fields by including flux flow. The results of this one dimensional (1D) model are in excellent agreement with quench experiments on multifilamentary conductors wound in a magnet. This 1D model works well because the thermal conductivity between windings is small, but including it in the model is nevertheless important to the agreement. DOE

N85-20908# Argonne National Lab., Ill.
COMPUTER SIMULATION OF GRAIN-BOUNDARY PROPERTIES IN IONIC CRYSTALS AND METALS
D. Wolf 1984 47 p refs Presented at the NATO Adv. Res. Workshop on Computer Simulation of Condensed Matter, Norwich, England, 22 Jul. 1984
(Contract W-31-109-eng-38)

(DE85-000577; CONF-8407101-1) Avail: NTIS HC A03/MF A01

The capabilities are demonstrated of a set of computer codes developed to determine the energies, structures, and point defect properties of interfaces in metals and ionic crystals. The calculated energies and structures of high angle < 100 > twist grain boundaries in fcc metal; and in metal oxides with NaCl structure are compared. The role of impurities and Schottky defects on the stability of such boundaries in the metal oxides is discussed. Particular emphasis is placed on the effect of the interatomic potential used in the calculations on the predicted physical properties of these grain boundaries. Those properties which depend on the potential chosen (i.e., on the particular material considered) and those phenomena which are independent of potential are summarized. DOE

N85-20909# National Bureau of Standards, Washington, D.C. Center for Materials Science.

INFLUENCE OF INDIVIDUAL REFLECTIONS ON THE PRECISION OF PARAMETER ESTIMATES IN LEAST SQUARES REFINEMENT

E. Prince and W. L. Nicholson Aug. 1984 27 p refs Presented at 13th Congr. of Intern. Union of Cryst., Hamburg, 9 Sep. 1984 Prepared in cooperation with Pacific Northwest Lab., Richland, Wash.

(Contract DE-AC06-76RL-01830)

(DE85-000830; PNL-SA-12490; CONF-8409165-1) Avail: NTIS HC A03/MF A01

A formula is derived to determine the effect of additional measurements on the precision of refined parameter estimates when a correct structure model established. This formula is used in an analysis of the multiple refinements based on the data from the single crystal intensity, and it is shown that the weighting scheme used in previous studies places a very heavy emphasis on a small number of weak reflections. It is also shown that, if integrated intensities or values of F(2) are used as the observations, weak reflections have little or no influence on the refinement. An approach to the proper utilization of weak reflections is suggested, and a procedure for improving the precision of parameter estimates when experimental times are limited is proposed. DOE

N85-20910# State Univ. of New York, Stony Brook. Dept. of Materials Science and Engineering.

SURFACE PHYSICS AND CRYSTALLOGRAPHY Technical Progress Report, 1 Nov. 1983 - 31 Oct. 1984

F. P. Jona 1984 12 p

(Contract DE-AC02-80ER-10750)

(DE85-003128; DOE/ER-10750/T2) Avail: NTIS HC A02/MF A01

This report concerns research on surface physics and crystallography that was carried out at the National Synchrotron Light Source (NSLS). A list of the scientific papers published or submitted for publication during the current year is given. A description of the scientific projects undertaken is presented. DOE

N85-20911# Miami Univ., Oxford, Ohio. Dept. of Physics.

FERROMAGNETIC RESONANCE IN A Ni-Mo SUPERLATTICE

M. J. Pechan, M. B. Salamon, and I. K. Schuller Oct. 1984 11 p refs Presented at Magnetism and Magnetic Mater. Conf. and Exhibit, San Diego, Calif. 27 Nov. 1984 Prepared in cooperation with Illinois Univ., Urbana, Argonne National Lab., Ill.

(Contract W-31-109-eng-38)

(DE85-003039; CONF-841184-10) Avail: NTIS HC A02/MF A01

Ferromagnetic resonance (FMR) was measured, at room temperature and at 4.2 K, on a layered Ni(249A) to Mo(83A) superlattice. The resonance position as a function of the angle between the film normal and the applied field was examined. From these measurements q = 2.2 + or - 0.05 and a magnetization of 220+20 Oe are obtained. While the g-value agrees with that of bulk Ni, the magnetization is lower than that obtained for bulk Ni and also for this sample using both light scattering and direct measurement techniques. It is shown that a reduced value of the magnetization is consistent with perpendicular uniaxial anisotropy. The separations are an order of magnitude too small to be due to spin wave resonances with the spin wave stiffness of bulk Ni. The highest field resonance indicates a magnetization of 331 Oe. This suggests the existence of Ni regions which experience negligible anisotropy. DOE

N85-20912# California Univ., Berkeley. Lawrence Berkeley Lab.

SUBNANOSECOND TIME-RESOLVED EMISSION STUDY OF Cu2O AND GaAs

J. S. Weiner Aug. 1984 119 p refs

(Contract DE-AC03-76SF-00098)

(DE85-5002070; LBL-18276) Avail: NTIS HC A06/MF A01

A series of time-resolved luminescence and light scattering experiments are presented which are aimed at studying how nonequilibrium electron-hole populations excited by picosecond laser pulses in semiconductors reach equilibrium. The development of a time-delayed coincidence photon counting system for the time-dependent measurements is described, and this system is tested by measuring the photoexcited free carrier lifetimes in GaAs doped with deep impurities. The bulk of this thesis is devoted to the study of the dynamics of excitons in Cu2O. A model is developed to explain quantitatively the lineshape of nonthermalized luminescence spectra in Cu2O which have been obtained with continuous wave lasers. The time-dependence of the ortho-exciton and para-exciton populations in Cu2O as a function of temperature was measured. It is demonstrated that the orthoexciton lifetime is dominated by its decay into the para-exciton, and furthermore, this decay rate increases with temperature as T(3/2). DOE

N85-20913# Cologne Univ. (West Germany). Inst. fuer Physics.

OBSERVATION OF STANDING SPINWAVES IN THIN Fe-FILMS BY MEANS OF RAMAN SPECTROSCOPY

S. Blumenroeder, E. Zirngiebl, P. Gruenberg, and G. Guentherodt, II Sep. 1984 15 p refs Presented at 30th Ann. Magnetism and Magnetic Mater. Conf., San Diego, Calif., 27-30 Nov. 1984 Prepared in cooperation with Kernforschungsanlage, Juelich, West Germany

(Contract W-31-109-eng-38)

(DE85-003036; CONF-841184-9) Avail: NTIS HC A02/MF A01

The first observation of standing spinwaves in thin evaporated Fe-films by Raman scattering (RS) is reported. The range was extended down to d approx. = 120 A using BS and to a range of 40 to 80 A using RS. It is found that for values of d comparable to the penetration depth of the light the scattering intensity decreases together with d. It is assumed that the scattering intensity is determined by the net magnetic moment resulting within the probing depth of the light. The mode frequencies observed by Raman scattering follow very well a D(sub ex)* d(-2) relationship from which the value of the exchange parameter D(sub ex) was determined. With decreasing d an increasing linewidth of the standing spinwaves is observed. This is attributed to the increased importance of surface roughness on the damping of these modes. DOE

N85-20914# Argonne National Lab., Ill.

OPERATING EXPERIENCE AND CONSTRUCTION STATUS OF ATLAS

R. C. Pardo, P. DenHartog, K. W. Shepard, and G. Zinkann 1984 15 p refs Presented at Symp. of Northeastern Accelerator Personnel, Stony Brook, N.Y., 16 Oct. 1984

(Contract W-31-109-eng-38)

(DE85-002741; CONF-8410172-3) Avail: NTIS HC A02/MF A01

The present Argonne Tandem-Linac accelerator provided 4402 hours of experimental beam time with a wide variety of heavy-ions. New beams accelerated by the linac include 300 MeV (82) Se and 390 MeV (109) Ag. In tests, the tandem accelerated 102 MeV (127)I. This is the heaviest beam ever accelerated by the Argonne tandem. The long-term performance of the niobium resonators appears to be good. No significant degradation of performance has been observed for most resonators over many years of use with the exceptions of problems caused by catastrophic vacuum accidents. Resonators whose performance has deteriorated after vacuum accidents have been restored to their original performance

state by a simple technqiue. The technique used is to rinse the interior of the resonator with a sequence of baths of solvents and water. DOE

N85-20915# Sandia Labs., Albuquerque, N. Mex.
MAGNETIC AND STRUCTURAL PROPERTIES OF SHOCK-SYNTHESIZED ZINC FERRITE
E. L. Venturini, B. Morosin, and R. A. Graham 1984 11 p refs Presented at the 30th Ann. Conf. on Magnetism and Magnetic Mater., San Diego, Calif., 27-30 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-000469; SAND-84-1398C; CONF-841184-1) Avail: NTIS HC A02/MF A01

High-pressure shock wave loading on stoichiometric mixtures of zinc oxide and ferric oxide powders produces partial conversion to a spinel structure zinc ferrite as shown by X-ray diffraction. The ferrite phase is characterized by a substantial saturation magnetization plus a high-field susceptibility. Since stoichiometric ZnFe2O4 is paramagnetic above 10 K, the magnetic behavior of the shock-synthesized spinel demonstrates that it is a zinc-deficient ferrite. The X-ray diffraction data confirm that less zinc oxide is consumed than ferric oxide in producing the recovered spinel. DOE

N85-20916*# Cincinnati Univ., Ohio. Dept. of Physics.
ELECTRONIC STRUCTURE OF SILICON SUPERLATTICES
Srinivasan Krishnamurthy and John A. Moriarty (California Univ. Lawrence Livermore Lab.) 1984 23 p refs Presented at Intern. Conf. on Superlattices, Microstructures, and Microdevices, Urbana-Champaign, Ill., 13 Aug. 1984
(Grant NAG1-204; Contract W-7405-eng-48)
(NASA-CR-175536; NAS 1.26:175536; DE85-000471; UCRL-90014; CONF-840877-3) Avail: NTIS HC A02/MF A01 CSCL 20L

In the utilization of a new complex band structure technique, the electronic structure of model Si-Si(-x-Ge(x) and MOS superlattices was obtained over a wide range of layer thickness d (11 less than or equal to d less than or equal to 110 A). For d greater than or equal to 44 A, it is found that these systems exhibit a direct fundamental band gap. Further calculations of bandedge effective masses and impurity scattering rates suggest the possibility of a band structure driven enhancement in electron mobility over bulk silicon. DOE

N85-20917# California Univ., Santa Barbara. Dept. of Physics.
SIMULATING SUPERSYMMETRY AT THE SSC
R. Michael Barnett and Howard E. Haber Aug. 1984 5 p refs Presented at the DPF Summer Study on the Design and Utilization of the Superconducting Super Colider, Snowmass, Colo., 23 Jun. - 13 Jul. 1984 Prepared in cooperation with California Univ. Lawrence Berkeley Lab., California Univ., Berkeley, California Univ., Santa Cruz, and Stanford Linear Accelerator Center
(Contracts DE-AM03-76SF-00010; DE-AC03-76SF-00515; DE-AC03-76SF-00098; Grants NSF PHY-83-18358; NSF PHY-81-15541)
(DE85-000699; LBL-18301; CONF-8406198-10) Avail: NTIS HC A02/MF A01

Careful study of supersymmetric signatures is required in order to distinguish them from Standard Model physics backgrounds. To this end, an efficient, accurate computer program which simulates supersymmetric particle production and decay (or other new particles) was created. The full matrix elements were incorporated, keeping track of the polarizations of all intermediate states. (At this time hadronization of final-state partons is ignored). Using Monte Carlo techniques this program can generate any desired final-state distribution or individual events for Lego plots. Examples of the results of the study of supersymmetry at the Superconducting Super Collider (SSC) are provided. DOE

N85-20918# Midwest Research Inst., Golden, Colo.
PRELIMINARY STUDIES ON THE LOW-COST PREPARATION OF CHALCOGENIDE SEMICONDUCTORS FROM SOLUTION DEPOSITIONS
Y. W. Chen, J. A. Turner, and R. Noufi Nov. 1984 16 p refs Presented at Fall Meeting of the Electrochem. Soc., New Orleans, 7 Oct. 1984
(Contract DE-AC02-83CH-10093)
(DE85-000538; SERI/TP-212-2528; CONF-841058-11) Avail: NTIS HC A02/MF A01

Low cost solution deposition processes such as electrodeposition, chemical conversion and electrochemical conversion were employed to prepare chalcogenides and chalcopyrites such as Cu-Se, Cu-Te, Cd-Se, Cd-Te, Cu-In-Se, and Cu-In-Te systems. The deposition processes were studied by cyclic voltammetry, rotating disk, rotating ring disk, X-ray diffraction, and surface analyses. The as deposited films are amorphous and exhibited p type photovoltaic activity. The electrodeposition of copper selenides on n-Si and n-CdX (X = S, Se, Te) showed that heterojunctions were formed. DOE

N85-20919# California Univ., Berkeley.
IMPURITY COMPLEXES IN PURE ELEMENTAL SEMICONDUCTORS Ph.D. Thesis
R. E. McMurray, Jr. Oct. 1984 186 p refs
(Contract DE-AC03-76SF-00098; Grant NSF DMR-82-03430)
Avail: NTIS HC A09/MF A01

Although several impurity complexes in germanium had been previously explained in the context of a tunneling hydrogen model, additional understanding was needed. Also, several impurity complex centers had still remained unexplained, and three of these in particular, those due to carbon nitrogen centers, make up a prominent portion of the research. In addition, to providing a satisfactory model to explain all of the known experimental facts which were discovered regarding these carbon nitrogen impurity complexes, many of the properties of other impurity complexes were brought together in a way in which they can be understood as an overall system of complexes, rather than as isolated cases. Such was the situation for the group II impurity hydrogen complexes, and for the overcharged acceptors of the groups I and II impurities. The existing knowledge of electrically active shallow impurity complex centers in elemental semiconductors is brought together. DOE

N85-20920# National Bureau of Standards, Washington, D.C. Center for Chemical Physics.
LASER STUDIES OF CHEMICAL DYNAMICS AT THE GAS-SOLID INTERFACE Progress Report
R. R. Cavanagh and D. S. King 26 Sep. 1984 4 p
(Contract DE-AI05-84ER-13150)
(DE84-017590; DOE/ER-13150/T1) Avail: NTIS HC A02/MF A01

Desorption experiments of NO on Ru (001) over a range of rotational states over 40 cm to 735/cm revealed no net polarization effect, and there is no preservation of the molecular orientation during the slow thermal desorption. The Doppler line width measurements on NO/Ru (001) require the molecular speed and/or angular flux distribution to depend on rotational state. The NO/Pt (111) system was also studied. DOE

N85-20921# Sandia Labs., Albuquerque, N. Mex.
AlAs/GaAs SUPERLATTICE BARRIER UNIPOLAR DIODE STRUCTURE
T. J. Drummond, H. P. Hjalmarson, R. P. Pearah (Illinois Univ., Urbana), and H. Morkoc (Illinois Univ., Urbana) 1984 4 p refs Presented at the Intern. Electron Devices Meeting, San Francisco, 10 Dec. 1984
(Contract DE-AC04-76DP-00789)
(DE85-001904; SAND-84-1597C; CONF-841234-1) Avail: NTIS HC A02/MF A01

GaAs capacitor structures employing a thin undoped layer of (Al, Ga)As as a dielectric have been described and successfully used as gates in field effect transistors with transconductors exceeding 200 ms/mm at 77K to improve the interface and bulk properties of the barrier, an AlAs/GaAs. The I-V characteristics measured for the superlattice barrier structures had greatly reduced currents and a much larger degree of rectification than could be

explained by conventional thermionic emission theory. A new theoretical model describing phonon-assisted emission provides a very good qualitative fit to the measured data. With the aid of this model dramatic evidence was found for believing the conduction band offset in the AlAs/GaAs system is approximately 60% of the difference in the direct bandgaps. DOE

N85-20922# Brookhaven National Lab., Upton, N. Y. Metallurgy and Materials Science Div.

INFRARED MODULATION OF PHOTOLUMINESCENCE IN GLOW DISCHARGE AMORPHOUS SILICON

C. Varmizis, M. D. Hirsch, and P. E. Vanier 1984 9 p refs Presented at the Intern. Conf. on Optical Effects in Amorphous Semiconductors, Snowbird, Utah, 1 Aug. 1984

(Contract DE-AC02-76CH-00016)

(DE85-016993; BNL-35144; CONF-840881-1) Avail: NTIS HC A02/MF A01

Duel beam photoluminescence (PL) from a-Si:H was measured at various temperatures by exciting the sample with a modulated infrared (IR) beam in addition to a steady beam of visible light. Varying the modulation frequency revealed that the IR caused a transient enhancement of the PL, followed by a slow quenching effect. The IR excitation spectrum showed quenching by photons with energies between 0.45 and 1.1 eV, similar to the IR quenching of photoconductivity. The fast process enhanced the emission peak equally at all energies, while the slow process quenched only the high energy side of the peak. These results can be explained by the re-excitation of holes from safe traps by the IR, followed by recombination at dangling bonds. DOE

N85-20923# Brookhaven National Lab., Upton, N. Y.

MAGNETIZATION MEASUREMENTS ON MULTIFILAMENTARY Nb3Sn AND NbTi CONDUCTORS

A. K. Ghosh, K. E. Robins, and W. B. Sampson 1984 5 p refs Presented at the Applied Superconductivity Conf., San Diego, Calif., 9-13 Sep. 1984

(Contract DE-AC02-76CH-00016)

(DE85-001237; BNL-35253; CONF-840937-13) Avail: NTIS HC A02/MF A01

The effective filament size has been determined for a number of high current Nb3Sn multifilamentary composites. In most cases it is much larger than the nominal filament size. For the smallest filaments (approx. 1 micron) the effective size can be as much as a factor of forty times the nominal size. Samples made by the internal tin, bronze route, and jelly roll methods were examined with filaments in the range one to ten microns. Rate dependent magnetization and flux jumping were observed in some cases. NbTi composites ranging in filament size from nine to two hundred microns and with copper to super-conductors ratios between 1.6:1 and 7:1 were examined in the same apparatus. Low field flux jumping was only observed in conductors with very large filaments and relatively little stabilizing copper. DOE

N85-20924# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering.

ATOMISTIC STUDIES OF GRAIN BOUNDARIES WITH SEGREGATED IMPURITIES Final Progress Report, Jul. 1983 - 30 Jun. 1984

V. Vitek Jan. 1984 22 p refs

(Contract DE-AC02-79ER-10429)

(DE85-000063; DOE/ER-10429/T3) Avail: NTIS HC A02/MF A01

The empirical scheme of construction of interatomic potentials for pure metals and substitutional bindary alloys was extended to a much wider class of metals. Potentials were constructed for Fe-Cu system and potentials for Fe-Sn and Fe-Sb are being developed. Atomistic studies of the grain boundaries with impurities were made for Cu-Bi, Cu-Ag, Ag-Au and Au-Ag systems. Segregation was found to occur in the three former alloys but not in the latter. A saturation of the segregant was found beyond which no further segregation can occur. In the case of Cu-Bi this corresponds to about 1.25 monolayer, in very good agreement with experimental data. In general, transformations of the structure are invoked by segregation and their extent depends on the alloy system. They are most pronounced in the Cu-Bi system. Studies of the trapping of H and He by the grain boundaries in Ni show that H is not very effectively trapped by the boundaries and thus it is unlikely to segregate. DOE

N85-20925# Sandia Labs., Albuquerque, N. Mex.

SI-ON-INSULATOR FORMATION USING A LINE-SOURCE ELECTRON BEAM

J. A. Knapp 1984 4 p refs Presented at the Symp. on the Sci. Basis for Nucl. Waste Management, Boston, 26 Nov. 1984

(Contract DE-AC04-76DP-00789)

(DE85-003449; SAND-84-1271C; CONF-841157-20) Avail: NTIS HC A02/MF A01

A line-source electron beam was used to melt and recrystallize isolated Si layers to form Si-on-Insulator structures. The process is simulated by heat flow calculations. Using sample sweep speeds of 100 to 600 cm/s and peak power densities up to 75 kW/sq cm in the 1 x 20 mm beam, single-crystal areas as large as 50 x 350 microns were obtained. Seed openings to the substrate are used to control the orientation of the regrowth and the heat flow in the recrystallizing film. A finite-element heat flow code is developed which correctly simulates the experimental results and which allows the calculation of untried sample configurations. DOE

N85-20926# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Electronique et Physique.

STUDY OF METAL OXIDE SEMICONDUCTOR STRUCTURES BY CAPACITIVE TRANSIENT SPECTROSCOPY [ETUDE DE STRUCTURES METAL - OXYDE - SEMICONDUCTEUR PAR SPECTROSCOPIE DE TRANSITOIRES CAPACITIFS]

Romain Coppard 25 May 1984 203 p refs In FRENCH

(ENST-84E011; ISSN-0751-1353) Avail: NTIS HC A10/MF A01

Deep layer transient spectroscopy was used to study the Si/SiO2 interface of a metal oxide semiconductor (MOS). The study detected and characterized dipoles in Al/SiO2/Si structures. The effect of an electric field on the emission of carriers trapped at the interface was investigated using a specially derived polarization cycle. Results suggest that an impurity band is formed as mobile ions congregate at the interface, and that dipolar relaxation occurs in MOS. Investigation of electric field effects reveals the donor nature of interface states. Author (ESA)

N85-20927# Chicago Univ., Ill. Materials Research Lab.

[RESEARCH IN SURFACE SCIENCES, DISORDERED MATERIALS, AND SOLIDIFICATION AND GROWTH] Annual Report, 1 Jul. 1983 - 30 Jun. 1984

Ole J. Kleppa Sep. 1984 91 p refs

(Grant NSF DMS-82-16892)

(PB85-132140; NSF/DMR-84001) Avail: NTIS HC A05/MF A01 CSCL 20B

Progress achieved in four areas (surface sciences, disordered materials, solidification and growth, and electron microscopy) is reported for the period from July 1, 1983 through June 30, 1984. Work on the surface sciences has focused on surface diffusion, adsorption and desorption, surface phonon spectroscopy, gas surface interactions, and two dimensional phase transitions. Research on disordered materials has examined localization, spin glasses, amorphous semiconductor superlattices, and disorder, order, and structure in silicates. Solidification and growth studies have examined nucleation, pattern formation, and the glass transition. GRA

N85-20928# United Kingdom Atomic Energy Authority, Harwell (England). Nuclear Physics Div.

MOESSBAUER STUDY OF AMORPHOUS Fe(67)Co(18)B(14)S(1)

G. Longworth and J. I. Budnick (Connecticut Univ., Storrs) Oct. 1984 22 p refs

(AERE-R-11526; HC84/4132(C14)) Avail: Issuing Activity

The bulk and surface layers at the shiny side of a ribbon of as quenched Metglas 2605 CO (Fe67Co18B14S1) were shown to consist solely of an amorphous phase using Fe-57 Mossbauer

spectroscopy, while a small amount of crystalline Fe86Co30 was found in the corresponding layers at the dull side indicative of a lower quench rate. From the amorphous component spectrum, values were determined for the correlations between the hyperfine field and the isomer shift, and the field and quadrupole interaction values at the iron sites. The presence of surface crystalline phases in a sample annealed at 369C did not have a deleterious effect on the magnetomechanical coupling factor ku. The crystallization sequence in (Fe6Co16B6S1) consisted of the precipitation of alpha Fe(Co) until the composition of the amorphous material reached (Fe,Co)75B25 (approx. 427C) followed by precipitation of Fe2B at temperatures above about 450C. E.A.K.

N85-20018# Joint Publications Research Service, Arlington, Va.
SIEMENS, PHILIPS MEGAPROJECT TO YIELD SUPERCHIP IN 5 YEARS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-85-005) 5 Feb. 1985 p 51-58 Transl. into ENGLISH from NRC Handelsblad (Rotterdam), 7 Nov. 1984 p 1 (For primary document see N85-20013 11-23)
Avail: NTIS HC A04/MF A01

N85-20790# Joint Publications Research Service, Arlington, Va.
PHONON-IMPURITY RELAXATION AND ACOUSTIC WAVE ABSORPTION IN YTTRIUM-ALUMINUM GARNET CRYSTALS WITH IMPURITIES Abastract Only
S. N. Ivanov, I. M. Kotelyanskiy, and V. V. Medved *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-001) 9 Jan. 1985 p 3 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 3, Mar. 1984 p 641-647 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

N85-20791# Joint Publications Research Service, Arlington, Va.
ELECTRON-OSCILLATORY SPECTRA OF YTTRIUM-ERBIUM-ALUMINUM GARNET OF CRYSTALS AND THEIR ROLE IN LASER PUMPING Abstract Only
Sh. Dzheordzhesku, V. I. Zhekov, T. M. Murina, M. N. Popova, and M. I. Studenikin *In its* USSR Rept.: Phys. and Math. (JPRS-UPM-001) 9 Jan. 1985 p 3-4 Transl. into ENGLISH from Fiz. Tverdogo Tela (Leningrad), v. 26, no. 3, Mar. 1984 p 641-647 (For primary document see N85-20786 11-70)
Avail: NTIS HC A03/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-20929# Pittsburgh Univ., Pa.
EXPLORATIONS INTO THERMODYNAMICS ANALOGIES AND CRITICAL POINTS IN REFERENCE TO GAS-SOLID TRANSPORT
M. P. Mathur, D. Wildman, S. T. Tuba, and G. E. Klinzing 1984 19 p refs
(Contract DE-FG22-84PC-71503)
(DE85-000816; DOE/PC-71503/T1) Avail: NTIS HC A02/MF A01

Experimental data from several investigators where the solid voidage were determined experimentally and were analyzed to test the ability of a cubic van der Waals equation to represent the solid flow, gas flow and voidage. Using the van der Waals format, phase diagrams were constructed for a number of particulate systems which were scrutinized. From this information the critical properties of the solids can be found. A generalized reduced properties plot was constructed and shows to be unique in representing all the data. Exploration into the pressure drop domain shows the relationship between the phase diagrams by an analytical approach. DOE

N85-20930# Oak Ridge National Lab., Tenn. Physics Div.
ACCIDENTAL DEGENERACIES, HIDDEN SUPERSYMMETRIES, AND SPECTRUM-GENERATING SUPERALGEBRAS
A. B. Balantekin 1984 6 p refs Presented at Intern. Symp. on Nucl. Shell Model, Philadelphia, 31 Oct. 1984
(DE85-003547; CONF-841044-2) Avail: NTIS HC A02/MF A01

Several Hamiltonians have appeared in the literature which exhibit degeneracies that do not seem to be explainable in terms of hidden symmetry groups. Such Hamiltonians are shown to constitute supersymmetric quantum-mechanical systems. The concept of spectrum-generating superalgebras is introduced and coordinate space representations of the relevant non-compact superalgebras Osp(1/2) and SU(1,1/1) are exhibited. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N85-20931# Oak Ridge National Lab., Tenn.
DATA AND INFORMATION SYSTEMS AND DECISION MAKING IN LARGE PUBLIC ORGANIZATIONS: RESEARCH AGENDA
Bruce E. Tonn Nov. 1984 104 p refs
(Contract DE-AC05-84OR-21400)
(DE85-003639; ORNL/TM-9263) Avail: NTIS HC A06/MF A01

Data management systems and new technology computer systems have transformed society and in the future will continue to affect change in society. Organizations of every size and type, from large corporations to small businesses, now find their data and information systems indispensable for routine data processing (inventory, pay, and personnel) and decision support applications. ORNL has initiated a research program that focuses on the use of data and information systems in large public organizations. Within this initiative are opportunities to study problems, ranging from comparing the task performance of competing large scale and various types of small scale computers and data systems to designing systems tools to graphically illustrate an organization's information flows. There are two general purposes: (1) to argue that the tremendous potential of computer based technology to continue to change our society warrants nationwide studies of the relationships between data and information systems and society; and (2) to introduce three research areas (knowledge engineering, decision theory, and policy modeling) that may yield insights into designing new data and information systems which will improve decision making in large organizations. DOE

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-20932# University of Southern California, Redondo Beach. Behavioral Technology Labs.
COMPUTER AIDED OF MAINTAINABILITY DESIGN: A FEASIBILITY STUDY Interim Report, Sep. 1983 - Nov. 1984
D. M. Towne and M. C. Johnson Nov. 1984 41 p
(Contract N00014-80-C-0493)
(AD-A149293; TR-104) Avail: NTIS HC A03/MF A01 CSCL 09/2

Computer-implemented processes have been developed to aid a designer in determining the maintainability consequences of design decisions. These processes operate upon detailed sequences of diagnosis and repair actions generated by a model of corrective maintenance performance, PROFILE. The design aiding processes generate summaries of maintenance times, actions, false replacements, and other related maintenance measures to aid in the discovery of maintainability problems, the analysis of design

options, and the projection of expected maintenance workload. The PROFILE model of diagnosis and repair performance requires data concerning the possible effects of failures within the system under design. A general-purpose fault simulation system will be developed which will generate the required data from design specifications of the type produced within conventional CAD systems. With the completion of the fault simulation capability, the PROFILE model and its associated maintainability analysis processes can be employed within a conventional CAD environment. Author (GRA)

N85-20933# Defense Systems Management School, Fort Belvoir, Va.
PROGRAM MANAGER: THE JOURNAL OF THE DEFENSE SYSTEMS MANAGEMENT COLLEGE. VOLUME 13, NUMBER 6, NOVEMBER-DECEMBER 1984
R. W. Ball Dec. 1984 42 p
(AD-A149546; DSMC-63) Avail: NTIS HC A03/MF A01 CSCL 15/5

A variety of topics, many dealing with business, are given. Program management, productivity improvement, spare parts, contracts, and government procurement are discussed. R.J.F.

N85-20934# National Academy of Sciences - National Research Council, Washington, D. C.
MAJOR FACILITIES FOR MATERIALS RESEARCH AND RELATED DISCIPLINES Final Report
Jul. 1984 88 p refs
(Contract DE-FG01-84ER-45062; Grant NSF DMR-84-08962)
(PB85-108850) Avail: NTIS HC A05/MF A01 CSCL 05A

At the request of the President's Office of Science and Technology Policy, the National Research Council formed the Major Materials Facilities Committee to recommend priorities for major facilities for materials research. These facilities, defined as those with initial costs of at least $5 million, include sources of synchrotron radiation and steady state and pulsed neutrons. The Committee's recommended priorities for the development and construction of facilities during the next decade include two categories: major new facilities and new capabilities at existing facilities. The Committee concluded that both categories are essential for the effective evolution of science and advanced technology in the United States in the next decade and beyond. It noted that the recommended priorities embody two prerequisites: (1) that they be accompanied by expanded support of smaller materials research programs, including related instrumentation, and (2) that resources must be provided to operate existing user facilities productively. GRA

N85-20935# National Bureau of Standards, Gaithersburg, Md.
STATE MEASUREMENT LABORATORIES: PROGRAM DESCRIPTION (PART 1). DIRECTORY (PART 2) Final Report
H. V. Opperman Nov. 1984 73 p refs
(PB85-137651; NBS/SP-686-Pt-1/2; LC-84-601142) Avail: NTIS HC A04/MF A01 CSCL 14B

The National Bureau of Standards receives repeated requests from industry and Federal agencies (e.g., Department of Defense, Nuclear Regulatory Commission) for information about the capabilities of and services provided by State measurement laboratories. This directory is a compilation of such information by State, including a description of the services available and fees charged. The directory will be updated annually in January of each year to coincide with the issuance of annual certification of these laboratories. GRA

N85-20181# Joint Publications Research Service, Arlington, Va.
STATUS OF SPECIFIC FRG HIGH TECH RESEARCH FUNDED BY BMFT
Joerg Kieser and Michael Sellschopp *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 117-125 Transl. into ENGLISH from VDI Nachr. (Dusseldorf), 12 Oct. 1984 p 28 (For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-20936# Hanford Engineering Development Lab., Richland, Wash.
QUALITY OF SCIENTIFIC AND ENGINEERING DATA
W. L. Delvin Jul. 1984 49 p refs
(Contract DE-AC06-76FF-02170)
(DE85-000294; HEDL-7471) Avail: NTIS HC A03/MF A01

Quality is a subject receiving much attention today within industry and government agencies. This attention focuses basically on the quality of products, which are the outputs of work activities. A primary product of research and development is data, the quality of which should be of concern to both users and the scientists and engineers producing data. The literature offers only bits and pieces of information on the nature of quality as applied to data. Five characteristics of quality data were developed by refining and expanding several concepts found in the literature. These characteristics are validity, integrity, reliability, preservation, and retrievability and they collectively define quality as it relates to data. The practices commonly used in research and development to assure quality of data are discussed and related to the five characteristics. This relationship between laboratory practices and the characteristics of quality is a basis for assessing the quality of data. DOE

N85-20937# California Univ., Livermore. Lawrence Livermore Lab. Technology Information System.
A DOE DIRECTORY OF DATABASES FOR MATERIAL PROPERTIES
Viktor E. Hampel, William A. Bollinger, Carol A. Gaynor, Clyde J. M. Northrup, Jr. (Control Data Corp.), and James J. Oldani (Sandia Labs., Albuquerque, N. Mex.) Aug. 1984 139 p refs Presented at 9th Intern. CODATA Conf., Jerusalem, 24-28 Jun. 1984
(Contract W-7405-eng-48)
(UCAR-10124) Avail: NTIS HC A07/MF A01

The contents of an integrated directory of data bases of material properties are described in this publication. This online directory is being installed on the Technology Information System at the Lawrence Livermore National Laboratory (LLNL/TIS). It is intended to announce the availability of, and interactive access to scientific and technical data bases of nuclear, atomic, molecular, physical, chemical, and mechanical properties of substances. In addition to the 139 data files previously reported, data bases under development and use at several DOE laboratories are identified. The contents of the data bases are described and information is provided on the availability of the data bases and their online access over public telephone and data networks. The online directory is prepared for use by DOE scientists and engineers and should enhance the awareness and sharing of S&T resources over secure communication networks, e.g., the imminent DOE OPMODEL. A growing number of the numeric data bases and predictive systems listed are directly accessible by authorized users via the TIS Intelligent Gateway Processor at LLNL (TIS/IGP) with self guiding procedures for the downloading, merging, post processing, and graphical/statistical analysis of the data. B.W.

N85-20938# California Univ., Livermore. Lawrence Livermore Lab. Technology Information System.
POST-PROCESSING OF BIBLIOGRAPHIC CITATIONS FROM DOE/RECON, NASA/RECON, AND DOD/DROLS
William A. Bollinger, Viktor E. Hampel, Isom Harrison, and Thomas P. Murphy Aug. 1984 17 p refs Presented at the 8th Intern. Online Inform. Meeting, London, 4-6 Dec. 1984
(Contract W-7405-eng-48)
(DE85-000617; UCRL-89995-Rev-1; CONF-841243-Rev-1) Avail: NTIS HC A02/MF A01

An interactive, self guided program for the joint post processing of bibliographic citations from the federal information centers of the Department of Energy (DOE), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA) was developed. Users are individually authorized for automated access to specific information centers, and use standard commands for the downloading, compilation, and online review of citations in a common format. Previously reported post processing capabilities were expanded, permitting: (1) online citation review, categorization, and addition of new data elements; (2) disassembly and reassembly of citations; (3) statistical analysis of data field contents; (4) cross correlation of data field contents; and (5) concordance generation. The new two pass interpreter for the post processing program permits the transformation of abbreviated data field names into English names preferred by each agency, the statistical analysis of the density and completeness of data field in selected sets of bibliographic citations, the elimination of redundant citations, and trend analysis. The latter is a powerful tool for the exploration of time dependent characteristics in a particular field of research, of an organization, or for an author. Graphical displays of publication rates as a function of time and the normalized statistics of terms used in the description of the work, can be used to signal new directions of ongoing research and the intensity of its support. DOE

N85-20939# Stanford Linear Accelerator Center, Calif.
AID: ACCESS TO INFORMAL DOCUMENTATION
R. B. Chaffee Aug. 1984 5 p Presented at 12th ACM Spec. Interest Group on Univ. and Coll. Computing Serv. User Conf., Reno, Nev., 11 Nov. 1984
(Contract De-AC03-76SF-00515)
(DE85-000418; SU-SLAC-PUB-3422; CONF-8411110-1) Avail: NTIS HC A02/MF A01

Access to stored information requires prior knowledge of the subject. This goes also for the documentation for computer programs and operating systems; before the best documentation for the rephalgamize command can be used one has to know that it exists and that it applies to the specific situation. If rephalgamize is not a word that springs to mind, one may never discover the existence of that command. An experimental program which addresses this problem was used for the last 4 years on the large IBM timesharing system at the Stanford Linear Accelerator Center (SLAC). The program, called AID, has generated interesting questions and provides many suggestions and answers. DOE

N85-20940# Oak Ridge National Lab., Tenn.
REQUIREMENTS FORMULATION SUBTASK 1.A OF THE MAJOR ITEM SYSTEM MAPPING (MISM) PROJECT
P. Y. Bengtson, P. A. Clark, G. R. Hadder, M. M. Stevens, E. Thomas, Jr., and T. A. Vineyard 1984 88 p Presented at the MISM Functional Working Group, Oak Ridge, Tenn., 7-9 Feb. 1984
(Contract DE-AC05-84OR-21400)
(DE85-000978; DOE/OR-21400/T45) Avail: NTIS HC A05/MF A01

The following tasks are necessary for establishing a data base of specific information on specific hardware relationships that can be easily maintained and retrieved on-line: (1) development of specific descriptions of functional capabilities; (2) review of user requirements and objectives; (3) cataloging of requirements for standard and special reports and what if reports; (4) definition and classification of information systems for MICOM, TSARCOM, TACOM, CECOM, AMCCOM, Medical, Security, development commands, and project monitors; (5) definition of the scope and the level of detail for the MISM process to include BOIP production requirements; (6) identification of source files and system and organization interfaces for establishment of the MISM data base; (7) definition of the data interchange requirements; (8) definition of the communication rrequirements; (9) definition of standard retrieval requirements; (10) definition of applications for standard and special reports and for potential what if questions; and (11) definition of standard graphics capabilities. DOE

N85-20941# Council on Environmental Quality, Washington, D.C.
SOURCEBOOK: GAINING ACCESS TO US GOVERNMENT INFORMATION ON THE ENVIRONMENT AND NATURAL RESOURCES
F. M. OHara, Jr., comp. and I. OHara, comp. Nov. 1984 127 p refs
(DE84-017419; DOE/PE-T1) Avail: NTIS HC A07/MF A01

Services and publications offered by the US government that provide information about the environment and natural resources are described. These sources of information include referral services, public-information offices, computerized data banks, information-analysis centers, and publication-distribution systems as well as published sources like bibliographies, abstract and index journals, reports, handbooks, and atlases. The subject matter covered by this sourcebook includes air pollution, meteorology, water resources and quality, fisheries, aquaculture, marine science, solid and hazardous waste treatment, land use, soil science, population and demography, anthropology, architecture, geography, urban studies, health, biology, agriculture, forestry, habitat, wildlife, geology, minerals, and related sciences and technologies. DOE

N85-20942# National Commission on Libraries and Information Science, Washington, D. C.
PRESERVE THE SENSE OF EARTH FROM SPACE
Aug. 1984 64 p refs
(PB85-124121; LC-84-18972) Avail: NTIS HC A04/MF A01 CSCL 05B

The results of a three-month effort by the panel on the information policy implications of archiving satellite data are presented. The findings and recommendations of the panel are as follows: (1) it is in the public interest to maintain an archive of land remote sensing satellite data for historical, scientific, and technical purposes; (2) the data in question are a national resource worthy of preservation for the advancement of science and other applications, and while the cost of archiving these data is not insignificant, it is extremely small relative to the investment in the space segments of the satellite remote sensing systems; (3) it is in the public interest to control the content and scope of the archive and to assure the quality, integrity, and continuity of the data; and (4) the maintenance of such an archive is, therefore, a responsibility that should be borne by the U.S. Government. GRA

N85-20435*# Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
A CATALOGUE OF DYNAMIC PARAMETERS DESCRIBING THE VARIABILITY OF THE MIDDLE STRATOSPHERE DURING THE NORTHERN WINTERS
K. Labitzke and B. Goretzki *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 5 May 1982 31 p refs Sponsored by the Deutsche Forschungsgemeinschaft (For primary document see N85-20434 11-42)
Avail: NTIS HC A09/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 05B

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-20943# Tennessee Univ., Knoxville. Transportation Center.
ELECTRIC VEHICLE DEMONSTRATION PROJECT Final Report
Michael S. Bronzini and Jeffrey W. Hodgson Aug. 1984 94 p
(Contract DE-FC08-79NV-10033)
(DE85-002167; DOE/NV-10033/1) Avail: NTIS HC A05/MF A01

Information is provided on electric and hybrid vehicle procurement, testing, maintenance, data collection and operational experience. Recommendations are offered to prospective electric vehicle operators. DOE

N85-20944# City of Austin, Tex. Urban Transportation Dept.
ELECTRIC VEHICLE DEMONSTRATION PROJECT Final Report
A. Brecher 1984 5 p
(Contract DE-FC08-79NV-10029)
(DE85-003124; DOE/NV-10029/1) Avail: NTIS HC A02/MF A01

Fifteen electric vehicles (nine vans, four sedans, two pickups) were assigned to eight different city departments and were operated and maintained for a four year period. Information on daily operations, maintenance, and battery replacements, was collected on each vehicle and analyzed. It was concluded that electric vehicles can be used for some city services; however, the cost per mile to operate and the incidence of downtime was considerably higher compared to similar gasoline or diesel powered vehicles. The high cost to operate the electric vehicles is attributed to: the low usage of the vehicles, the high degree of maintenance, frequent battery replacements, and poor performance. Use of the fleet was minimal, averaging only 6654 miles per unit for the entire project period. The highest mileage recorded on any one vehicle was 13,509 miles and the lowest mileage recorded was 1337 miles. DOE

N85-20945# National Aerospace Lab., Amsterdam (Netherlands).
TASK AND FUTURE OF THE LARGE INSTITUTES OF TECHNOLOGY (LIT) [TAAK EN TOEKOMST VAN DE GROTE TECHNOLOGISCHE INSTITUTEN]
May 1984 26 p In DUTCH
(B8474720) Avail: NTIS HC A03/MF A01

Activities and significance of the Dutch Energy Research Center, the Laboratory for Ground Mechanics, the Dutch Naval Research Institute, the National Aviation and Space Laboratory, and the Waterway Laboratory are outlined. Author (ESA)

N85-20182# Joint Publications Research Service, Arlington, Va.
FRENCH RESEARCH MINISTER ON POLICY, TECHNOLOGY TRANSFER
Ph. Grange and J.-C. Hanus *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-008) 19 Feb. 1985 p 128-135 Transl. into ENGLISH from Micro et Robots (Paris), Nov. 1984 p 42-45
(For primary document see N85-20174 11-31)
Avail: NTIS HC A07/MF A01

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-20946 Bayerische Akademie der Wissenschaften, Munich (West Germany). Deutsche Geodaetische Kommission.
DEVELOPMENT OF A PORTABLE ZENITH CHAMBER AND ITS USE ON THE 47TH PARALLEL Ph.D. Thesis - Technical Univ., Graz [ENTWICKLUNG EINER TRAGBAREN ZENITKAMMER UND IHR EINSATZ IM 47. PARALLEL]
Guenter Chesi 1984 92 p refs In GERMAN
(Ser-C-287; ISBN-3-7696-9337-X; ISSN-0065-5325) Copyright. Avail: Issuing Activity

A zenith chamber for astronomical fixing of position was developed. The chamber has to be portable and sturdy since it is to be used for alpine applications. The Zenith chamber BE1 is compared with other zenith chambers. All astronomical corrections are made by time functions, so that date and exposure time suffice for the computer calculation. The evaluation of the measurements on the 47th parallel and the possibilities for further development are presented. Author (ESA)

N85-20947 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
CONTRIBUTIONS OF THE X-RAY ASTRONOMY GROUP
Nov. 1984 20 p refs Presented at 25th COSPAR Meeting on X-Ray Astron., Graz, 3-7 Jul. 1984 Submitted for publication
(MPE-Preprint-28; ISSN-0340-8922) Copyright. Avail: Issuing Activity

The X-ray structure of the Crab Nebula; millisecond rotational periods among low-mass X-ray sources observed by EXOSAT: optical and X-ray observations of 4U2129+47/V1727 CYG; simultaneous EXOSAT and optical observations of the pulsing X-ray binary H2252-035; and EXOSAT observations of the galactic bulge X-ray source GX17+2 were discussed. For individual titles, see N85-20948 through N85-20951.

N85-20948 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
THE X-RAY STRUCTURE OF THE CRAB NEBULA
W. Brinkmann, B. Aschenbach, A. Langmeier, G. Hasinger, and T. Bork *In its* Contrib. of the X-Ray Astron. Group 1984 p 1-4 refs (For primary document see N85-20947 11-89)
Avail: Issuing Activity

Einstein telescope and EXOSAT data were used to assess a model of the interaction of the Crab Nebula and X-ray energy centered on a pulsar. The half power radius of the EXOSAT picture of 40 is larger than that of EINSTEIN 34 due to the different energy bands. The model predicts a ratio for these radii of 1.112, in good agreement with the measured value. The EXOSAT-LE2 light curve (obtained from 1/4 of the whole data) was derived and the pulse fluxes were determined. Whereas in the EINSTEIN picture the pulsed flux makes up 3.9 + or - 0.2 % of the total nebular flux, the ratio in the EXOSAT data is 2.8 %, consistent with the extrapolation of the known pulse ratios. Author (ESA)

N85-20949 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

SEARCH FOR MILLISECOND ROTATIONAL PERIODS IN SOME LOW-MASS X-RAY BINARIES OBSERVED BY EXOSAT

A. Langmeier, M. Sztajno, and J. Truemper *In its* Contrib. of the X-Ray Astron. Group 1984 p 5-8 refs (For primary document see N85-20947 11-89)

Avail: Issuing Activity

A search for millisecond rotational pulsations in the X-ray emission of the low-mass X-ray binaries MXB1728-34, 4U1702-42, 4U1705-44, 4U1755-33 and GX17+2 was conducted by the EXOSAT medium energy experiment argon counters (1 to 20 keV) with a time resolution of 7.8125 millisec. Periods in the range from 16 msec to 8 sec were sought. Upper limits of 1.5% to 5% are found at a 3 sigma level. The negative result of the search does not necessarily imply that the observed sources are not millisecond rotators. The magnetic field may be too weak to influence the accretion flow in a way to cause an observable modulation of the X-ray flux. Scattering by circumstellar material may smear out the X-ray pulsations. The periods may be outside the period search interval. Author (ESA)

N85-20950 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

OPTICAL AND X-RAY OBSERVATIONS OF 4U2129+47/V1727 CYG IN A QUIESCENT STATE

W. Pietsch, H. Steinle, and M. Gottwald (European Space Operations Center) *In its* Contrib. of the X-Ray Astron. Group 1984 p 9-12 refs (For primary document see N85-20947 11-89)

Avail: Issuing Activity

The 5.2 h X-ray binary 4U2129+47 was observed for more than 1 orbital cycle on 29 Septemter and 4 October 1983 using the LE, Me and GSPC detectors of EXOSAT. In neither detector is an X-ray flux from the source detected. Quasi-simultaneous UBV observations using a 2.2 m telescope failed to detect the large amplitude light curve reported in earlier observations but show the optical companion in a low intensity state. The large amplitude light curves is interpreted as due to X-ray heating of the optical star by the X-ray source similar to the system Her X-1/Hz Her. Optical observations indicate that the heating X-ray source is shut off and explain that EXOSAT failed to detect the source; 4U2129+47 behaves similar to Her X-1 in the optical quiescent state. Author (ESA)

N85-20951 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

EXOSAT OBSERVATIONS OF THE GALACTIC BULGE X-RAY SOURCE GX17+2

M. Sztajno, J. Truemper, H. U. Zimmermann, and A. Langmeier *In its* Contrib. of the X-Ray Astron. Group 1984 p 14-17 refs (For primary document see N85-20947 11-89)

Avail: Issuing Activity

The X-ray flux of the bright galactic bulge source GX17+2 was measured in the energy range 1 to 20 keV by the EXOSAT ME experiment. During 8 hr continuous observation an X-ray flare was observed (lasting 1 hr) followed by an intensity increase. The data show intensity dips with a quasiperiod of 1.4 hr and quasi-periodic oscillations on a time scale of 200 to 500 sec, possibly connected with oscillations of an accretion disk. The spectrum can be fitted by two black body spectra with kT1 = 1keV, and kT2 = 2keV, respectively, and an iron line at 6.3 + or - 0.3 keV having 130 eV equivalent width. While the low energy component is stable, the 2keV component shows considerable intensity variations. It is suggested that the latter component represents emission from the inner part of the accretion disk while the soft spectrum is black body emission from the surface of the neutron star. Author (ESA)

N85-20952 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

CONTRIBUTIONS OF THE X-RAY ASTRONOMY GROUP

Nov. 1984 41 p refs Presented at Symp. on X-Ray Astron. 1984, Bologna, 26-30 Jun. 1984 Submitted for publication (MPE-Preprint-29; ISSN-0340-8922) Copyright. Avail: Issuing Activity

The X-ray coronas of late stars; observation of soft X-rays from Nova Muscae 1983 with EXOSAT the X-ray structure of the Crab Nebula; the Crab-pulsar X-ray light Curve; EXOSAT observations of the 35d intensity variations of Her X-1; pulse phase spectroscopy of Her X-1 with EXOSAT; fine structure in the absorption dips of Her X-1 as observed by EXOSAT; simultaneous EXOSAT and optical observations of the pulsing X-ray binary H2252-035/AO Psc; spectral studies of low-mass X-ray binaries observed by EXOSAT; and EXOSAT observations of 4U1705-44 were discussed. For individual titles, see N85-20953 through N85-20960.

N85-20953 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany).

X-RAY CORONAE OF LATE TYPE STARS: THEORETICAL IMPLICATIONS

J. H. M. M. Schmitt *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 1-6 refs (For primary document see N85-20952 11-89)

Avail: Issuing Activity

Einstein Observatory evidence for the ubiquity of coronae in late type stars is reviewed. The observed X-ray activity can be interpreted and understood in terms of models originally developed in the solar context. The existence of a corona seems to be linked to the existence of a subphotospheric convection zone; the hypothesis is that loop-like structures, as seen in the coronae of other stars is consistent with X-ray spectra. However, multicomponent IPC pulse height spectra are shown not to necessarily indicate the presence of physically distinct X-ray emitting structures, and structures containing emission measured at various temperatures such as loops may also account for the observed multicomponent X-ray spectra. Author (ESA)

N85-20954 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

THE X-RAY STRUCTURE OF THE CRAB NEBULA

B. Asenbach, W. Brinkmann, A. Langmeier, G. Hasinger, and T. Bork *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 8-11 refs (For primary document see N85-20952 11-89)

Avail: Issuing Activity

Einstein telescope and EXOSAT data were used to asses a model of the interaction of the Crah Nebula and X-ray energy centered on a pulsar. The half power radius of the EXOSAT picture of 40' is larger than that of EINSTEIN 34' due to the different energy bands. The model predicts a ratio for these radii of 1.112, in good agreement with the measured value. The EXOSAT-LE2 light curve (obtained from 1/4 of the whole data) was derived and the pulse fluxes were determined. Whereas in the EINSTEIN picture the pulsed flux makes up 3.9 + or - 0.2 % of the total nebular flux, the ratio in the EXOSAT data is 2.8 %, consistent with the extrapolation of the known pulse ratios. Author (ESA)

N85-20955 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestriche Physik.

RECENT RESULTS ON THE CRAB PULSAR X-RAY LIGHT CURVE

G. Hasinger *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 12-15 refs (For primary document see N85-20952 11-89)

Avail: Issuing Activity

X-ray data of NP0532 from the HEXE balloon experiment and the EXOSAT observatory are presented. The ratio of second to first pulse changes systematically from optical to gamma ray wavelengths, assuming an extreme value in the hard X-ray region. The measurements are compared with a pulsar model, in which the two pulses are generated by synchrotron radiation near the last closed field lines above a single pole of a magnetized rotating neutron star. Radiation occurs in regions of magnetic instabilities near the light cylinder, where the plasma pressure overwhelms the pressure of the magnetic field. In this model excess radiation in the X-ray region within the interpulse and the second pulse might result from curvature radiation of the outstreaming e+e- plasma in the whole open magnetosphere. Author (ESA)

N85-20956 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
EXOSAT OBSERVATIONS OF THE 35d INTENSITY VARIATIONS OF HER X-1
H. Oegelman, P. Kahabka (Turbingen Univ.), W. Pietsch, J. Truemper, and W. Voges *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 16-19 refs (For primary document see N85-20952 11-89)
Avail: Issuing Activity

Following the 4 to 7 cycle prlonged off state of Her X-1, the source was observed by EXOSAT through a normal 35d cycle. The observations started on 1 March 1984 and covered one full 35d cycle from one high on state to another at 4 day intervals. The medium energy flux (2 to 20 keV) in the argon counters varies by a factor of 50 during this cycle, as in the past. The low energy telescope data in the 0.04 to 2 keV range represents the first 35d cycle sampling of the soft X-rays. The observed light curve is similar to the medium energy light curve. Author (ESA)

N85-20957 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
PULSE PHASE SPECTROSCOPY OF HER X-1 WITH EXOSAT
P. Kahabka, W. Pietsch, J. Truemper, W. Voges, E. Kendziorra (Turbigen Univ.), and R. Staubert (Tueringen Univ.) *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 20-23 refs (For primary document see N85-20952 11-89)
Avail: Issuing Activity

During March/April 1984 Her X-1 was observed in a series of 10 pointings spread approximately evenly through a 35 day cycle. Pulse profiles and source spectra obtained during the on and short on state were analyzed. It is suggested that the interpulse of the 1.24 sec variation is caused by a reflection of the primary beam from the inner edge of the accretion disk or a disk corona. Author (ESA)

N85-20958 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
SIMULTANEOUS EXOSAT AND OPTICAL OBSERVATIONS OF THE PULSING X-RAY BINARY H2252-035 / AO PSC
W. Pietsch, M. Pakull (Technische UniV., Berlin, West Germany), S. Tjemkes (Amsterdam Univ.), W. Voges, E. Kendziorra (Tubingen Univ.), and J. vonParadijs (Amsterdam Univ.) *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 25-30 refs (For primary document see N85-20952 11-89)
Avail: Issuing Activity

The 805 sec pulsing X-ray source H2252-035 was observed for 7 hr on September 14/15 and on September 17, 1983 in X-ray by EXOSAT. For part of the time on both observations simultaneous photometry at a 90 cm optical telescope was obtained. The 805 sec sinusoidal X-ray variation is clearly detected in the 2.3 to 7.9 keV range as a stable feature showing spectral hardening during pulse minimum and being well phase locked. In the optical 805 sec light curve, however, there is a 180 deg phase shift between the 2 nights. Reduced X-ray intensity is seen at the minimum of the optical data with an indication of a phase shift between the nights in the opposite direction to the shift of the optical maximum. The X-ray orbital modulation may be due to partial eclipse of the X-ray emitting hot spot on the white dwarf by a bulge at the outer edge of the accretion disk. Author (ESA)

N85-20959 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
SPECTRAL STUDIES OF LOW-MASS X-RAY BINARIES OBSERVED BY EXOSAT
M. Szatajno, J. Truemper, and A. Langmeier *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 31-34 refs (For primary document see N85-20952 11-89)
Avail: Issuing Activity

The X-ray emission of low-mass X-ray binary bursters MXB-1702-43, MXB1728-34, flaring source GX17+2, and bright bulge sources 4U1705-44 and 4U1755-338, which show evidence of orbital periods was studied. In MXB1728-34 an X-ray burst was observed. The burst analysis indicates that the maximum burst flux is close to Eddington limit, and the black body radius remains constant (8.5 + or - 0,7 km, for 5kpc distance) during the decay part of the burst. There is an indication for a 4.1 keV absorption feature during burst maximum. The persistent emission can be described by a simple exponential spectrum (kT=5.6keV) with a broad emission line feature superimposed around 6keV.
Author (ESA)

N85-20960 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
EXOSAT OBSERVATIONS OF 4U1705-44
A. Langmeier, M. Sztajno, and J. Truemper *In its* Contrib. of the X-Ray Astron. Group Nov. 1984 p 35-38 refs (For primary document see N85-20952 11-89)
Avail: Issuing Activity

During a 7 hr observation of 4U1705-44, 6 intensity dips, which show a quasiperiodicity of 1.3 hr were detected. There are intensity fluctuations in the range of 100 to 500 sec. These timescales may be interpreted in terms on an orbital period and oscillations of an accretion disk, respectively. The source spectrum (nondip and dip data) can be fitted by a Wien-Boltzmann function with a superimposed iron emission line at 6.2 + or - 0.2 keV. The temperature decreases from 2.93 keV to 2.68 keV during the dips. This behavior can be explained as a partial occultation of the extended X-ray source caused by a bulge (hot spot) at the edge of an accretion disk around the neutron star. Author (ESA)

N85-20961*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FUTURE OF ULTRAVIOLET ASTRONOMY BASED ON SIX YEARS OF IUE RESEARCH
Jaylee M. Mead, ed., Robert D. Chapman, ed., and Yoji Kondo, ed. Dec. 1984 542 p refs Symp. held in Greenbelt, Md., 3-5 Apr. 1984
(NASA-CP-2349; Rept-85B0016; NAS 1.55:2349) Avail: NTIS HC A23/MF A01 CSCL 03A

Physical insights into the various astronomical objects which were studied using the International Ultraviolet Explorer (IUE) satellite. Topics covered included galaxies, cool stars, hot stars, close binaries, variable stars, the interstellar medium, the solar system, and IUE follow-on missions. For individual titles, see N85-20962 through N85-21081.

N85-20962*# Wisconsin Univ., Madison. Washburn Observatory.
IUE ABSORPTION LINE STUDIES OF HIGHLY IONIZED INTERSTELLAR GAS
Blair D. Savage *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 3-16 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The IUE high dispersion echelle spectra of galactic and extragalactic sources have generally revealed the presence of absorption by interstellar Si IV and C IV. Occasionally N V was detected. The observational results relating to these species will be reviewed for H II regions, supernova remnants, galactic disk gas, galactic halo gas, and extragalactic gas. For the various regions, the likely origin of the ionization is considered. Author

N85-20963*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
HOT STARS: SIX YEARS OF PROGRESS
Catharine D. Garmany *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 17-26 refs Prepared in cooperation with Joint Inst. for Lab. Astrophysics, Boulder, Colo. (For primary document see N85-20961 11-89)
(Grant NAG5-78)
Avail: NTIS HC A23/MF A01 CSCL 03A

Mass loss is known to take place across the H-R diagram, but nowhere is it more pronounced than in the upper left hand corner. Here, winds from luminous stars peel away a solar mass in a million years or less. The winds of the OF, OB supergiants,

and W-R stars have received the most attention because they are so readily studied. Their effect on stellar evolution is significant also. On the other hand, it is the B stars whose variability was most thoroughly studied with IUE, undoubtedly because historically these stars were known to vary. The current state of observtional understanding of stellar winds, with particular emphasis on how the observations fit various theoretical predicitions is studied.
Author

N85-20964*# State Univ. of New York, Stony Brook. Dept. of Earth and Space Science.
SOLAR SYSTEM STUDIES WITH THE IUE: 1982 - 1984
John Caldwell *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 27-31 (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Planetary observations with the IUE in the last two years are summarized. These include the atmospheres of comets and the giant planets; aurorea; rings and circumplanetary environment. Planetary requirements for future Earth-orbital astronomical observatories are also described.
Author

N85-20965*# Dominion Astrophysical Observatory, Victoria (British Columbia).
MAGELLANIC CLOUD OBJECTS
J. B. Hutchings *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 32-41 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The considerable contributions of IUE to understanding the composition, stellar evolution, interstellar medium, and extinction of the Magellanic Clouds are discussed and compared with those for the galaxy. Future directions for UV work are suggested.
Author

N85-20966*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ULTRAVIOLET AND X-RAY OBSERVATIONS OF ACTIVE GALACTIC NUCLEI: CONSTRAINTS ON MODELS OF THE BROAD EMISSION LINE REGION
Richard Mushotzky *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 42-50 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The extensive ultraviolet spectra of broad line active nuclei and the large body of X-ray photometry and spectroscopy of these objects and the constraints that these data place on the photoionization models of the broad emission line region (BLR) are considered. Many active galactic nuclei, in particular quasars and Seyfert I's, are characterized by strong, broad (full width $>$ 2000 km/sec), emission lines from permitted transitions in abundant elements. In the simplist models these lines originate in clouds located at some characteristic distance from the central ionizing source in a quasi-spherical distribution. While the dynamics of these clouds are quite important, the emphasis is on how to derive the observed line strengths and line ratios.
Author

N85-20967*# Erlangen-Nuremberg Univ. (West Germany). Astronomical Inst.
INTERACTING BINARY SYSTEMS
Jurgen Rahe *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 51-63 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Information from ultraviolet observation of interacting binary stars is summarized and problems of current interest are examined.
B.G.

N85-20968*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
OUTER ATMOSPHERES OF COOL STARS OBSERVED WITH IUE
S. L. Baliunas *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 64-79 refs (For primary document see N85-20961 11-89)
(Grant NAG5-87)
Avail: NTIS HC A23/MF A01 CSCL 03A

Ultrviolet observations of cool stars in conjuction with coronal X-ray or ground based chromospheric measurements, or both have served both to refine and define understanding of stellar activity. The sensitivity of IUE down to a reasonable limiting magnitude made accessible many different stars' ultraviolet spectra. Understanding of stellar activity throughout stellar atmospheres has progressed because observation in the ultraviolet range of particular stars can be done in great detail.
B.G.

N85-20969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FUTURE ULTRAVIOLET EXPERIMENTS, INCLUDING FUSE/COLUMBUS Abstract Only
Albert Boggess *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 80 (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Several new facilities for ultraviolet astronomy are under construction or study for launch within the coming decade. These include the Hubble Space Telescope to be launched in 1986 with instruments for spectroscopy, imaging, and photopolarimetry in the ultraviolet; the ASTRO Spacelab payload, also to be launched in 1986 with a similar range of instrumentation; STARLAB, a combined Canadian, Australian and U.S. mission concentrating primarily on imagery; and the Far Ultraviolet Spectroscopic Explorer (FUSE), which was renamed COLUMBUS. COLUMBUS is currently under study by NASA and ESA as a future joint mission for spectroscopic studies of astrophysical plasmas covering a temperature range from approximately 10 to the 3rd power to approximately 10 to the 7th power k. In order to achieve this objective, the optics should be optimized for wavelengths below 1200 Angstroms, with a total wavelength range from approximately 2000 to approximately 100 Angstroms. The operational concept will be based on experience with IUE, but changes in communications techniques since IUE was designed suggest some interesting new approaches to observing.
Author

N85-20970*# Computer Sciences Corp., Silver Spring, Md.
UV OBSERVATIONS AND RESULTS ON PRE-MAIN SEQUENCE STARS
Catherine L. Imhoff *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 81-92 refs (For primary document see N85-20961 11-89)
(Contract NAS5-25774)
Avail: NTIS HC A23/MF A01 CSCL 03A

The T Tauri stars represent an invaluable probe of the physical mechanisms involved in star formation and the genesis of stellar magnetic fields and surface activity. Ultraviolet studies of the T Tauri and related stars were concentrated in four areas. First, the very strong Mg II emission lines were observed in order to determine fluxes, line profiles, and variability. Most evidence points to the formation of these strong lines in an extended atmosphere and/or wind. Second, the far-ultraviolet emission lines were observed to provide diagnostics of the hotter atmospheric regions. The behavior of these lines is very similar to that of the most active late-type stars, lending credence to the belief that many of the T Tauri characteristics are the result of high levels of surface activity. Third, the ultraviolet continuum, which originates largely in the chromosphere, shows potential as a chromospheric diagnostic. Finally, observations of related objects may be used to gain insight into the evolutionary changes occurring during pre-main sequences evolution.
B.G.

N85-20971*# Arizona Univ., Tucson. Steward Observatory.
WHITE DWARF STARS AT ULTRAVIOLET WAVELENGTHS
James Liebert *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 93-102 refs (For primary document see N85-20961 11-89)

(Grant NSF AST-82-18624)
Avail: NTIS HC A23/MF A01 CSCL 03A

Numerous discoveries with the IUE Observatory have stimulated research on most spectroscopic types of degenerate dwarf stars. The hottest helium-rich cases apparently have substantial abundances of certain ions heavier than helium, due most likely to selective radiative acceleration. Hydrogen DA stars show trace abundances at temperatures as low as 20,000 K and provide evidence for modest outflowing winds. Cooler DA stars exhibit mysterious broad features near 1400A and 1600A. The element carbon is almost omnipresent in cool helium-rich stars, unless metallic features are seen instead. The carbon is most likely dredged-up by a deep convective envelope. The metals are attributed to interstellar accretion. IUE has played an important role in temperature determinations for helium-rich and magnetic stars. White dwarf components in detached and cataclysmic binaries have been studied extensively with IUE, often for the first time. Among the potential results are mass determinations and information on the photospheric temperature distributions for accreting primaries. Author

N85-20972*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
SUPERNOVA REMNANTS AND THE CARBON ABUNDANCE IN M33
William P. Blair and John C. Raymond *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 103-106 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01

The IUE and optical spectral data on a supernova remnant in M33 was combined in order to determine the abundance of carbon in the interstellar gas of M33. New shock model calculations were used to guide the interpretation and a substantially lower value of the ratio c/o than was assumed previously for M33 may be necessary to explain the data. However, some inconsistencies in the observed and predicted line intensities indicate that the spectra may be partly contaminated by H II region emission or that the preshock gas was ionized by nearby stars. Author

N85-20973*# Rice Univ., Houston, Tex.
COMMENTS ON THE ORIGINS AND VARIATIONS OF CARBON AND NITROGEN IN THE ISM OF GALAXIES AS EVIDENT FROM IUE SPECTROSCOPY OF H 2 REGIONS c90
Reginald J. Dufour *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 107-110 refs Prepared in cooperation with Dominion Astrophysical Observatory, Victoria, British Columbia (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

During the last several years IUE observations of UV spectra of galactic and extragalactic H II regions have provided the first good quantitative measurements of gaseous phase C abundances in the ISM of several galaxies over a broad range of metallicity. The observed relative variations of C, N, and O based on IUE and ground based observations of H II regions are illustrated and the trends evident using current concepts regarding stellar nucleosynthesis of CNO element group and simple models of galactic chemical evolution are discussed. Author

N85-20974*# Rice Univ., Houston, Tex.
IUE SPECTROSCOPY OF EXTRAGALACTIC H H REGIONS
Reginald J. Dufour, Francies H. Schiffer, III (Computer Sciences Corp.), and Gregory A. Shields (Texas Univ., Austin) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 111-114 refs Prepared in cooperation with Dominion Astrophysical Observatory, Victoria, British Columbia (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The UV spectra of several prominent extragalactic H II regions were studied with the IUE during the two years. High dispersion spectra were obtained of N81 and N66A in the SMC, the 30 Doradus Nebula in the LMC, NGC 2363 in the SBm galaxy NGC 2366, NGC 5471 in M101, and NGC 604 in M33, that are superior in quality to low dispersion spectra in the statistical accuracy and resolution of the nebular emission lines of ions such as C III, Si III, N III, and O III. These data are combined with ground based spectroscopy to diagnose physical conditions (temperatures, densities, and ionization) and abundances in over twenty extragalactic H II regions derived from recent IUE low dispersion observations and/or archival spectra are also presented. Author

N85-20975*# Illinois Univ., Urbana-Champaign.
THE USUAL HOT STARS IN UNUSUAL GALAXIES
S. A. Lamb, J. S. Gallagher (Kitt Peak National Observatory, Tucson Ariz.), M. J. Hjellming, and D. A. Hunter (Kitt Peak National Observatory, Tucson, Ariz.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 115-118 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Two hot amorphous galaxies, NGC 1705 and NGC 1800 were successfully observed with the IUE when low dispersion, short wavelength data were obtained. These spectra, together with new optical data, indicate the OB stellar content of these systems is quite like that of the normal OB complexes found in spiral and regular Irr galaxies. Author

N85-20976*# Wisconsin Univ., Madison. Washburn Observatory.
HIGHLY IONIZED GAS ASSOCIATED WITH THE SMALL MAGELLANIC CLOUD c90
Edward L. Fitzpatrick and Blair D. Savage *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 119-122 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

High dispersion IUE spectra of Small Magellanic Cloud (SMC) stars are examined to search for evidence of a widespread distribution of highly ionized gas. For all of the stars, absorption by C IV and/or Si IV is found near 160 km/s, and is attributed to nebular material. In addition, the stars show absorption by the high ion lines in the range 100 to 130 km/s. This absorption might indicate the presence of global distributions of these ions, such as a hot phase of the interstellar medium or a halo-like region. Author

N85-20977*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GALACTIC ABSORPTION LINES MEASURED FROM THE IUE LOW DISPERSION SPECTRA OF ACTIVE GALAXIES
Chi-Chao Wu (Computer Sciences Corp.), C. J. Blades (Space Telescope Science Inst.), A. Boggess, and D. G. York (Chicago Univ., Ill.) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 123-126 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Galactic absorption lines were detected and measured from the low dispersion spectra of 10 active galaxies. Four of these are at galactic latitudes greater than 60 deg and the remaining 6 are at latitudes between 20 and 60 deg and behind high velocity 21 cm clouds. In our galactic absorption line systems, while C II wavelength 1335 is commonly seen, C IV wavelength 1550 is detected with confidence only in high latitude objects and Fairall 9 which has a latitude close to 60 deg and lies in the general direction of the Magellanic Clouds. The C IV to C II ratio is about one for the high latitude objects; and lower for the low latitude objects. This is consistent with the picture that C IV and C II exist mostly in the halo and disk, respectively. In the quasar absorption line systems, C II is rarely seen while C IV is generally strong. This suggests that the halo of intervening galaxies are large compared to their disk. Therefore, the slight lines to high z QSOs frequently intercept the halo but rarely both the disk and halo of intervening galaxies. Author

N85-20978*# Science Research Council, Didcot (England).
STRUCTURE OF THE SEYFERT BROAD LINE REGION AND ABSORPTION REGION OF NGC 4151
G. E. Bromage, A. Boksenberg (Royal Greenwich Observatory), J. Clavel (Observatoire de Paris-Meudon, France), A. Elvius (European Southern Observatory), M. H. Demoulin-Ulrich (Stockholm Observatory, Sweden), M. V. Penston (Royal Greenwich Observatory), G. C. Perola (Rome Univ. Italy), M. Pettini, M. A. J. Snijders, and E. G. Tanzi (Consiglio Nazionale delle Recerche, Milan) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 127-128 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The Seyfert nucleus of NGC 4151 was monitored for six years, including periods of intensive study of the complex variations in the ultraviolet spectra with IUE. Important IUE results relating to the broad line region (BLR) and its physical conditions are reviewed herein. Active galactic nuclei like NGC 4151 are studied to derive detailed constraints on radiation mechanisms and physical conditions in the emission region, and hence also constraints on possible central power sources. The ultraviolet spectrum of NGC 4151 comprises continuum, strong emission lines with different widths along with a rich absorption line spectrum. Variations in the broad absorption lines seem to derive principally from changes in column densities of absorbing species rather than in velocity dispersions or line profiles. R.S.F.

N85-20979*# Texas Univ., Austin. Dept. of Astronomy.
BROAD EMISSION FEATURES IN ACTIVE GALACTIC NUCLEI
Hagai Netzer, Beverley J. Wills, D. Wills, and W. Wamsteker (European Space Agency, Vilspa, Spain) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 129-132 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Simultaneous ultraviolet and optical observations of several Seyfert 1 galaxies and QSOs were carried out in an attempt to understand some broad emission features between 2000 and 5000 A. Most of the emission is due to Fe II and Balmer continuum. Improved model calculations were used to estimate the flux in these components and to compare the strengths of the ultraviolet and optical Fe II lines. Spectral fitting shows that the ultraviolet Fe II lines are much stronger than previously believed. Strong ultraviolet Fe II lines are present even in objects showing weak optical Fe II lines. The total flux in Fe II lines sometimes exceeds the Lyman alpha flux by up to a factor of 2, and there may well be a general Fe II/Lyman alpha problem, with important consequences for the modeling of the broad emission line region in active galactic nuclei. R.S.F.

N85-20980*# New York Univ., New York. Dept. of Physics.
THE UV SPECTRA OF INTERMEDIATE REDSHIFT QUASARS
A. L. Kinney, P. J. Huggins, J. N. Bregman, and A. E. Glassgold *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 133-134 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

A sample of 21 intermediate redshift quasars were observed with the IUE in order to study their line and continuum properties. In addition, 18 of the quasars were observed by the Einstein observatory. These measurements allow study of the ionizing continuum and the anomalous L sub alpha/H sub beta ratio in a well defined sample of quasars. The data also allow determination of the percentage of the quasar continuum that is covered by gas clouds. The main results are: (1) the mean UV slope for this sample is -0.99 + or - 0.11; (2) the mean slope from 1200 A to 2 keV is -1.45 + or - 0.03; (3) two thirds of the objects have UV slopes that extrapolate to more than two sigma above the X-ray flux; (4) for 11 objects, the mean L sub alpha/H sub beta ratio is 8.3 + or - 1.4; and (5) the covering factor is estimated to be about 0.17. R.S.F.

N85-20981*# New York Univ., New York. Dept. of Physics.
MULTIFREQUENCY OBSERVATIONS OF BL LAC OBJECTS AND VIOLENTLY VARIABLE QUASARS
Joel N. Bregman, A. E. Glassgold, P. J. Huggins, and A. L. Kinney *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 135-138 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The status of a program to obtain simultaneous multifrequency spectra of BL Lac objects and violently variable quasars from the X-ray through radio wavebands is discussed. The importance of the ultraviolet data is illustrated for defining the overall shape of optically thin synchrotron emission, its relation to the X-ray emission, and the determination of basic physical parameters of the continuum emitting region. Author

N85-20982*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VERY RECENT IUE OBSERVATIONS OF 2 BL LACERTAE OBJECTS
C. M. Urry (Johns Hopkins Univ.), Y. Kondo, K. R. H. Hackney (Western Kentucky Univ.), R. L. Hackney (Western Kentucky Univ.), S. L. Mufson (Indiana Univ.), and W. Z. Wisniewski (Arizona Univ.) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 139-142 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

IUE observations of two BL Lacertae objects, consisting of two spectra of 1218+304 and 12 spectra of Mrk 421, are presented. The former object has never been observed with IUE, possibly because it is very faint, but the fact that it is an X-ray source, and a highly variable one, makes it particularly interesting. Mrk 421 has been observed many times with IUE as part of a continuing monitoring program. The present observations indicate an intensity decrease of approximately 25% on a timescale of one month, with little if any associated spectral change. With one exception, the spectra of these two objects show no discrete features, and the continua are well fit by power law models. The one exception is a long SWP exposure of Mrk 421, from March 9, 1984, which shows a broad emission feature near approximately 1580 A. The validity of this feature has not yet been established. Author

N85-20983*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COORDINATED MULTIFREQUENCY OBSERVATIONS OF THE BL LAC OBJECTS MRK 180, MRK 421, AND MRK 501
S. L. Mufson (Indiana Univ.), D. J. Hutter (Georgia State Univ.), K. R. H. Hackney (Western Kentucky Univ.), R. L. Hackney (Western Kentucky Univ.), Y. Kondo, C. M. Urry, W. Z. Wisniewski (Lunar and Planetary Lab.), M. F. Aller (Michigan Univ.), and H. D. Aller (Michigan Univ.) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 143-146 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The properties of three BL Lacertae objects, namely Mrk 180, Mrk 421, and Mrk 501, were investigated using data gathered at UV, X-ray, optical, and radio wave lengths. From each time frozen spectrum an inhomogeneous, relativistic jet model was computed. It is noted that the UV is the one spectral region where synchrotron emission is seen uncontaminated by galactic emission, self-Compton emission, or optical depth effects. A steepening synchrotron emission spectrum from the IR to the UV, which is characteristic of relativistic jets, is present in the jet model that was developed. R.S.F.

N85-20984*# S M Systems and Research Corp., Lanham, Md.
FLUORESCENT EXCITATION OF Fe 2, Mn 2, Ti 2, N 1 LINES BY V 4, N 5, O 6: EMISSION LINES IN THE SPECTRA OF SYMBIOTIC STARS AND SEYFERT GALAXIES Abstract Only
Daya P. Gilra *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 147 (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

Analysis of the published IUE and ground based high resolution spectra of symbiotic stars, particularly RR Tel, shows that the dominant excitation mechanism of Fe II, Mn II, Ti II, and N I lines is the selective fluorescent excitation of some levels by the strong C IV, N V, and O VI emission lines. The same mechanism should work for the excitation of Fe II lines in the spectra of Seyfert galaxies and Q60's whose emission spectra are quite similar to those of symbiotic stars. The similarities and differences between the fluroescent excitation mechanism reported herein and the Bowen's mechanism is analyzed. Author

N85-20985*# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).

A MODEL FOR THE VARIABLE CONTINUUM OF THE SEYFERT 1 GALAXY NGC 5548

W. Wamsteker, P. Benvenuti, A. W. Harris, A. Talavera, C. Gry, A. Cassatella, B. Hassai, R. Gilmozzi, P. Barr (University Coll., London), and J. C. Clavel (Observatoire de Paris-Meudon, France) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 148-154 refs Prepared in cooperation with Texas Univ., Austin (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

The variations of NGC 5548 as observed by IUE are analyzed. The results indicate that the amplitude of the variation is largest at the shorter UV wavelengths. The implications of this wavelength dependence are of importance for the continuum modeling. A fit to a simultaneously obtained UV and optical spectra based on the Fe II fluorescence model of Netzer and Wills is shown to give an extremely good match with the data. The results presented show that the spectrum of the Seyfert I galaxy NGG 5548 can be fairly well represented by a combination of a single power law continuum, Fe II lines, Balmer lines, and continuum and stellar variability data suggest that the variations in the strength of the power law spectrum are not accompanied by large changes in the spectral index. Apparent spectral index variations can occur due to the difference in relative importance of individual components at different wavelengths. R.S.F.

N85-20986*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IUE OBSERVATIONS OF PLANETARY NEBULAE IN THE MAGELLANIC CLOUDS

Stephen P. Maran, Lawrence P. Aller (California Univ., Los Angeles), Theodore Gull, Charles D. Keyes (California Univ., Los Angeles), and Theodore P. Stecher *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 155-158 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

Four more planetary nebulae (PN) in the Magellanic clouds were observed with IUE (LMC P2, P9, P33, and SMC N43). Reliable C abundances were computed for each PN, and other abundances were calculated from ionization models taking the IUE and earlier groundbased spectra into consideration. P9 has the richest spectrum of any extragalactic PN studied in the UV; three ionization stages of N were detected. Three PN (LMC P40, SMC N2, N5) were reobserved to search for time variations that might be anticipated from the relatively high luminosities and masses that were derived for the central stars of these young, compact objects. For P40, with a derived central star mass of 1.2, the continuum observations hint at variation of the anticipated type but are not decisive. Author

N85-20987*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

1983 OBSERVATIONS OF THE ECLIPSING NUCLEUS OF THE BIPOLAR PLANETARY NEBULA NGC 2346

Walter A. Feibelman and Lawrence H. Aller (California Univ., Los Angeles) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 159-162 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

IUE data are presented of the eclipsing nucleus of NGC 2346 obtained at 3 phases of the 1983 observing season. At phi = 0.02, a highly asymmetric C IV emission line is seen, but the He II line has a gaussian profile with a slight suggestion of an inverse P Cygni character. The stellar continuum in the 1200 to 1950 A region and high excitation emission lines argue for a hot subdwarf component in the binary nucleus. Author

N85-20988*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IUE OBSERVATIONS OF THE JET EMISSION FEATURE IN R AQUARII

A. G. Michalitsianos, J. M. Hollis, and M. Kafatos (George Mason Univ.) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 163-166 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

IUE low dispersion observations of the jet emission feature in the symbiotic variable R Aquarii were obtained over the course of two years. A comparison SWP lambda 1200 to lambda 2000 spectra obtained for both this feature and the central UV star indicate significant differences exist between these emission regions; Si III lambda 1893 which is prominent in the central star is virtually absent in the jet. Based upon analyses of UV and optical emission line spectra, the spectral properties of the feature suggest it is a highly excited tenuous region approximately 10,000/cu cm characterized by prominent forbidden nebular line emission. Author

N85-20989*# Washington Univ., Seattle.

THE CHANGING ULTRAVIOLET SPECTRUM OF HERBIG-HARO OBJECT NO. 1

K. H. Bohm, E. Bohm-Vitense, and E. W. Brugel (Colorado Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 167-170 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

IUE spectra of H-H1 taken in March, 1982 and December, 1983 show steady qualitative changes of the short wavelength emission line spectrum. Earlier IUE studies (in 1979 and 1980) had shown the typical high excitation object ultraviolet spectrum with the CIV 1550 and the CIII 1909 lines being very strong. These line fluxes have steadily decreased and are presently not detectable on a 4-1/2 hour exposure. While the spectrum looked very similar to that of H-H2 in 1980, it now gives more the impression of the spectrum of a low excitation H-H object with a possible presence of fluorescent lines from the H2 Lyman bands. Author

N85-20990*# Colorado Univ., Boulder. Atmospheric and Space Physics Lab.

SHORT-WAVELENGTH OBSERVATIONS OF HH-2H AND HH-24A

Edward W. Brugel and J. Michael Shull *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 171-174 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

There still remains some debate about the exact origin of the very blue optical and ultraviolet continuum in Herbig-Haro objects. There is reasonably good evidence for a two photon continuum in HH-2H. It has been suggested that there is a significant contribution to the UV continuum from scattered light in the general Orion region. Evidence from spatially resolved IUE spectra is presented which indicates the continuum and emission line fluxes have the same spatial distribution. A very low ultraviolet extinction is indicated based upon an enhanced two photon origin for the UV continuum. A recent observation of HH-24A shows an interesting absence of high excitation emission lines and a weak continuum. Author

N85-20991*# Washington Univ., Seattle. Dept. of Astronomy.

DUST IN THE REGION OF HERBIG-HARO OBJECTS: THE CASE OF NGC 1999

J. A. Cardelli and K. H. Bohm *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 175-178 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Observations of the reflection nebula NGC 1999 (taken at a small offset angle) and its illuminating star V380 Ori were used to examine the properties of dust in the region of Herbig-Haro objects H-H 1 and H-H 2. The ratio of nebular intensity to stellar flux is fairly flat in the UV and is remarkably similar to that for NGC 7023/HD 200775 for small offset angles. If reflected light represents a strong contribution to the continua of H-H objects, then the results seem to rule out geometries in which this reflection arises from forward scattering of light from imbedded T Tauri stars. In addition, the extinction to V380 Ori was examined and found to be similar to the curve for HD 200775, both of which are lower than the average galactic extinction curve in the UV. This seems to justify the use of extinction curves like theta Ori for correcting the observations of H-H objects, particularly H-H 1 and 2, for reddening. Author

N85-20992*# Applied Research Corp., Dayton, Ohio.
IUE OBSERVATIONS OF BLUE HORIZONTAL BRANCH GLOBULAR CLUSTERS AND UV-BRIGHT STARS
Bruce M. Altner, Brian Holton (Rutgers Univ.), and Terry A. Matilsky (Rutgers Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 179-182 refs (For primary document see N85-20961 11-89)
(Grant NAG5-70)
Avail: NTIS HC A23/MF A01 CSCL 03A

Recent theoretical attempts to understand the later evolution of population II stars have met with some success in accounting for the positions of UV-bright stars in globular cluster color magnitude diagrams. In particular, model calculations have been published which suggest the existence of two distinct sub-classes of UV-bright star, based on their luminosity above the horizontal branch (HB). IUE observations of individual UV-bright stars in several globular clusters do indeed show a separation into two luminosity groups, with more than half of the stars belonging to the high luminosity class. Whereas spectra of resolved hot sources found in the cores of seven clusters lead us to believe that they are also UV-bright stars, unlike the stars outside the core they fall mostly in the low luminosity group. Author

N85-20993*# Hawaii Univ., Honolulu. Inst. for Astronomy.
A SEARCH FOR YOUNG STELLAR CHROMOSPHERES IN NGC 2264
Theodore Simon *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 183-186 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Pre-main sequence stars in the galactic cluster NGC 2264 were observed with IUE to search for ultraviolet chromospheric and transition region (TR) emission lines. Fifteen cluster members of spectral type A-K, ranging in age from 1 to 10 million years, and 4 other stars in the direction of the cluster were observed at low resolution. chromospheric emission was detected only in the faint H alpha emission line star NX Mon (W 79); its Mg II surface flux, F sub Mg is approximately = to 1 x 10 to the 9th power ergs/sq cm/s, is comparable to that observed for very active T Tauri stars. Upper limits on chromospheric and TR line emission of the remaining stars are comparable to the emission line strengths of solar-type stars in the Hyades and UMa clusters and of the youngest field stars. The bright pre-main sequence stars in NGC 2264 therefore have weaker chromospheres and TRs than do the T tau stars, but it is uncertain whether their activity levels are intermediate between those of the T Tau and older stars. R.S.F.

N85-20994*# Washington Univ., Seattle.
THE UV EXTINCTION LAWS IN TWO VERY YOUNG CLUSTERS, NGC 6530 IN THE GALAXY AND NGC 2100 IN THE LMC
Erika Bohm-Vitense, Paul Hodge, and Don Boggs *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 187-190 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The UV extinction for a number of O and B stars in the galactic cluster NGC 6530 was studied along with the extinction law for several stars in the LMC cluster NGC 2100. Distinct differences were found for different stars in the same cluster. In NGC 6530 a correlation of the extinction law with T sub EFF or with position in the cluster was observed. In NGC 2100 the 2200 A absorption appears to be much stronger in the center of the cluster. The interstellar gas line absorption for the stars in NGC 6530 was also studied. No correlation with the variations in the UV extinction law was found so far. Author

N85-20995*# Washington Univ., Seattle.
ULTRAVIOLET STUDIES OF THE YOUNG POPULOUS CLUSTER NGC 2100 IN THE LMC
Erika Bohm-Vitense, Paul Hodge, and Charles Proffitt *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 191-198 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Stars in the populous young cluster NGC 2100 were observed with IUE in the low resolution mode. Color excesses, effective temperatures and luminosities were determined for eight stars in the cluster. A comparison of observed and model atmosphere energy distributions shows that the Nandy et al. (1981) average LMC extinction curve does not give good matches for the cluster stars. For most of the cluster stars no hump in the extinction at 2200 A is observed and too little flux is observed between 1400 and 2000 A. Masses between 15 and 30 solar masses were found for the stars and an age of about 6 million years. Two stars, b27 and C1, may have an age of up to 12 million years. M.G.

N85-20996*# S M Systems and Research Corp., Lanham, Md.
IUE OBSERVATIONS OF INTERSTELLAR LINES Abstract Only
Daya P. Gilra *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 199 (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

About 350 spectra of 40 stars were obtained from the IUE Vilspa data bank and analyzed. The preliminary results include the discovery of lines due to interstellar germanium, gallium, and krypton. These elements are much less depleted than the iron group elements (it is possible that they are almost undepelted). Several intercombination lines of Fe II and several Ni II lines were discovered. With the observations of the intercombination lines the column densities can be easily derived since the lines are on the linear part of the curve of growth. It was also found that, there is a qualitative difference between the lines of highly ionized species such as C IV, Si IV arising in H II regions on the one hand and those arising in interstellar medium where no H II region can be traced. The H II region lines are considerably narrower. In both cases, however, multiple components are seen. Other results regarding the detection of Fe I and Mg I lines and lines from highly metastable levels of excited species are discussed. M.G.

N85-20997*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATIONS OF Mg 1 AND Mg 2 IN THE LOCAL ISM
F. C. Bruhweiler (Catholic Univ. of America), W. Oegerle (Space Telescope Science Inst.), E. Weiler (NASA, Washington, D.C.), R. Stencel (NASA, Washington, D.C.), and Y. Kondo *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 200-203 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

High quality IUE data combined with that acquired by Copernicus were used to study the Mg II/MG I ionization balance in the local interstellar medium within 50 pc of the Sun. The high

resolution, high signal to noise Copernicus data reveal, in three stars, weak interstellar Mg I features at 2852. High quality IUE data for interstellar Mg II near 2800 A were acquired by coadding high dispersion estimates and incorporating an observing technique that minimized the effects of camera fixed-pattern noise. The results are in agreement with the local cloud model as presented previously by Bruhweiler. The Mg I and Mg II column densities are used to place constraints on the physical conditions of the interstellar gas near the Sun. M.G.

N85-20998*# Science Research Council, Chilton (England).
THE DEPENDENCE OF INTERSTELLAR ELEMENT DEPLETIONS ON MEAN SPACE DENSITY
Alan W. Harris, Gordon E. Bromage, and Cecile Gry (European Space Agency, Madrid) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 204-206 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

Correlations of interstellar gas-phase depletions with hydrogen column density N(H), and with mean line-of-sight space density bar-n(H) = N(H)/r, are investigated for 14 elements. For the 6 most depleted elements, correlations ith bar-n(H) are clearly stronger than with N(H). In general, the survey supports the proposal that depletion is mainly governed by density-dependent processes. It also suggests that depletion occurs in relatively low density gas as well as in dense clouds. Author

N85-20999*# Colorado Univ., Boulder.
HIGH-VELOCITY INTERSTELLAR GAS IN THE LINE-OF-SIGHT TO HD 50896 c90
Joy N. Heckathorn (Computer Sciences Corp.) and Robert A. Fesen *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 207-210 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

Using high-dispersion IUE spectra, a large interstellar shell structure was discovered in the line-of-sight to the Wolf-Rayet star HD 50896. Blue-shifted interstellar absorption lines indicative of high-velocity gas are present in the spectra of four B stars located up to 2 deg away from HD 50896 and at a distance of 1000 to 1400 parsecs, suggesting a linear diameter for the structure of at least 40 parsecs. These high-velocity components, present only in the low ionization lines and exhibiting nearly cosmic abundances, can be interpreted as a heretofore unknown and extremely old supernova remnant. The existence of such a supernova remnant potentially associated with HD 50896, a runaway Wolf-Rayet star believed to have a compact companion, implies that HD 50896 may be a binary in its second Wolf-Rayet phase of evolution. M.G.

N85-21000*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE VARIATION OF GALACTIC INTERSTELLAR EXTENCTION IN THE ULTRAVIOLET Abstract Only c90
A. N. Witt (Toledo Univ., Ohio), R. C. Bohlin (Space Telescope Science Inst.), and T. P. Stecher *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 211 Submitted for publication (For primary document see N85-20961 11-89)
(Grants NAG5-167; NAGw-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

The interstellar extinction in the UV was determined from IUE spectra for 29 reddened early-type stars by use of the pair method. The star sample was selected on the basis of highly deviant ratios of the strength of the 4430 A diffuse interstellar absorption feature to color excess E(B-V) (15 stars) and on the basis of association with reflection nebulae (9 stars). The incidence of peculiar extinction curves among this sample as measured by significant deviations from the mean galactic extinction law is near 70%. Deviations in the strength of the 2175 A extinction bump appear to occur independently of deviations in the rise of the far-UV extinction at 1250 A in about 35% of the stars. On the average, stars associated with dense interstellar clouds exhibit weaker UV extinction in the lambda < 2500 A range than do stars observed through low-density diffuse clouds, if normalized to constant E(B-V). At 1250 A this difference between the averages of the two groups amounts to 27%, measured in units of the average galactic extinction per unit E(B-V) at 1250 A, but wide dispersions are evident for both groups. M.G.

N85-21001*# Osservatorio Astronomico, Trieste (Italy).
INTERSTELLAR EXTINCTION IN THE NUCLEUS OF H PER Abstract Only c90
A. Magazzu (SISSA-ISAS, Trieste) and R. Stalio (National Solar Observatory, Tucson, Ariz.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Year of IUE Res. Dec. 1984 p 212 Submitted for publication (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

The extinction curves in the direction of four early-b main sequence stars located in the nucleus of h Per were constructed and compared with each other and with the extinction curves derived from eight stars of the same general area but lying at different distances. Ultraviolet-blue-visual (UBV) photometry and low dipsersion optical and ultraviolet (IUE) spectroscopy were used to derive these curves. The interstellar reddening law in the line of sight of the four h Per stars is constant. This result, together with the constant color excess found by Crawford et al. (1970) for a larger sample of member stars, indicates that there is no appreciable gradient in the properties of the dust particles within the nucleus itself. The same curves agree well with the curves derived from stars located in the region of the Perseus arm surrounding the cluster. This indicates that the interstellar medium in h Per has the same properties as the medium outside the cluster; thus the high energy radiation and mass fluxes produced by the very large number of hot star populating h Per do not affect the properties of the dust particles. It was also found that there is a rather smooth decrease of the extinction per unit distance with increasing height from the galactic plane. M.G.

N85-21002*# Delaware Univ., Newark.
CORONAL EFFECTS OF THE WINDS OF EARLY-TYPE STARS c90
Wayne L. Waldron *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 215-218 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

The X-ray emission fom early-type stars can be a dominant factor in determining the ionization structure of a stellar wind. Using a base coronal model, the UV resonance lines of N V, Si IV, and C IV are calculated by subjecting them to changes in the coronal emission measure, coronal temperature, and mass loss rate. The calculations predict that a unique behavior is present in the variations of these line profiles. This suggests that it would be possible to distinguish which quantity was responsible for the variation. A preliminary search for this predicted variability, using the high-resolution short wave prime (SWP) data from the IUE archives, was conducted for several stars. M.G.

N85-21003*# University of Western Ontario, London. Dept. of Astronomy.
SUPERIONIZED SPECIES AND WINDS IN LOW LUMINOSITY B AND Be STARS c90
Paul K. Barker, J. M. Marlborough, and J. D. Landstreet *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 219-222 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

High dispersion IUE spectra were obtained of 72 luminosity class III to V Be stars and 82 luminosity class IC to V normal (no H alpha emission) B stars, with the objects in each group distributed at random in projected rotational velocity and spectral type. For normal B stars, the C IV lambda 1548,50 resonance doublet is observed only at type B2 or earlier, whereas C IV can occur as

late as B9 among the Be stars. In both groups of stars the average C IV equivalent width is greatest at the earliest spectral types, and decreases rapidly in strength toward later types; however, at each spectral subtype a large range of C IV equivalent widths exists. From B0 to B2 the average C IV equivalent width is about a factor of two higher for Be stars than for normal B stars. For the Be stars there is no correlation between the equivalent widths of C IV absorption and He alpha emission. Neither normal B nor B stars show any clear correlation between C IV equivalent width and projected rotational velocity v sin i. C IV emission is definitely present in only two Be stars; this is sharp contrast to the magnetic stars in this spectral region, which frequently show C IV strongly in emission above the continuum. M.G.

N85-21004*# Washington Univ., Seattle.
STELLAR WINDS IN THE YOUNG GALACTIC CLUSTER NGC 6530 **c90**
Erika Bohm-Vitense and Paul Hodge *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 223-226 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

Line profiles for O stars on or close to the main sequence in the young galactic cluster NGC 6530 were studied. P Cygni profiles are seen for T(eff) > 36000K. Different stars show, however, different lines and different outflow velocities. The degree of ionization in the wind appears to depend on T(eff). M.G.

N85-21005*# Wisconsin Univ., Madison. Washburn Observatory.
MAIN SEQUENCE B STARS WITH STRONG WINDS **c90**
D. Massa and B. D. Savage *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 227-230 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

Low resolution IUE observations of BO-2V stars in several young open clusters were obtained as part of a poject to derive the UV extinction to the clusters. The aim was to use the extinction found from the B stars to deredden the cluster O stars. In the process, it became obvious that the BO-2V stars in the nuclear cluster of Sco OB1, NGC 6231, had very unusual UV spectra. A high dispersion IUE spectrum of one of the peculiar NGC 6231 B stars, BD-41 (deg) 7719, was obtained. The data indicate a mass loss rate which is much larger than normal B1V's. Some likely causes for the stron B star winds are considered. It is concluded that the peculiar spectra of the main sequence B stars in NGC 6231 are the result of an overabundance of carbon (and possibly other elements) in their atmospheres. Quantitative analysis shows that an enhancement of about 3 to 5 times solar is sufficient to explain the observations. M.G.

N85-21006*# Consiglio Nazionale delle Ricerche, Frascati (Italy).
IUE AND ESO OBSERVATIONS OF THE P CYG STAR AG CARINAE AND ITS RING NEBULA
R. Viotti, A. Altamore (Rome Univ., Italy), M. Barylak (European Space Agency. ESA Tracking Station, Madrid, Spain), A. Cassatella (European Space Agency. ESA Tracking Station, Madrid, Spain), R. Gilmozzi (European Space Agency. ESA Tracking Station, Madrid, Spain), and C. Rossi (Rome Univ., Italy) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 231-234 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

From a study of the optical and ultraviolet spectrum of the P Cyg variable AG Car, it is concluded that this high luminosity M(bol) approx. = -8.3), high mass loss star is a massive object evolving towards the WR region after a cool supergiant phase. Like in other superluminous stars, the large photometric and spectroscopic variations are attributed to flux redistribution of the stellar radiation due to structure variations of the expanding atmosphere. Author

N85-21007*# Computer Sciences Corp., Silver Spring, Md.
COORDINATED ULTRAVIOLET AND VISUAL OBSERVATIONS OF OMEGA ORIONIS 1982-1983
C. A. Grady, George Sonneborn, Chi-Chao Wu, Daniel P. Hayes (Columbia Univ.), E. F. Guinan (Villanova Univ.), Paul K. Barker (Univ. of Western Ontario), and H. F. Henrichs (Amsterdam Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 235-238 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Coordinated IUE high dispersion and visual observations of omega Orionis (HD 37490, B2 IIIe) in 1982 to 1983 covering periods of both low and high B-band linear polarization showed that line profile variability seen in the ultraviolet resonance lines of Si IV and C IV is not correlated with the visual continuum polarization state of the star. Variations in the visual colors and continuum fluxes are correlated with the amount of linear polarization. H-alpha emission strength variations are only weakly correlated with the polarization activity. The variation seen in C IV and Si IV is consistent with density perturbations propagating through the wind acceleration zone. The observed data are interpreted as indicating that the stellar wind is latitudinally separated from the continuum scattering envelope. Author

N85-21008*# Case Western Reserve Univ., Cleveland, Ohio.
THE SPECTROSCOPIC ANTICS OF S 18/SMC
Steven N. Shore, N. Sanduleak, and D. A. Allen (Anglo-Australian Observatory, Sidney) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 239-242 refs (For primary document see N85-20961 11-89)
(Grant NAG5-179)
Avail: NTIS HC A23/MF A01 CSCL 03A

Optical (3600 to 10,000 A) and IUE (1200 to 3200 A) observations of the peculiar, luminous early-type supergiant star S 18/SMC which cover the period 1981 to 1983 are presented. This is supplemented by objective prism and high dispersion studies from 1967 to 1983. The HeII 4686 line is variable in the optical, with HeII 1640, CIV 1550 and NV 1245 also variable. The FES magnitude data suggest that the photometric variations are less than 0.1 (m) P Cygni profiles are observed on the hydrogen lines to H9, and HeI, FeII, [FeII], NIII, and weak SiII are seen in the optical spectrum. The red CaII lines are strong in 1983. There is no evidence for a red companion. The UV spectrum is dominated by emission lines of nitrogen. The variations show a striking similarity to HV475, and the UV spectrum and derived N enhancement is quite similar to Sanduleak's star in the LMC. Evidence for a nitrogen overbundance of a factor of the order of 70 is presented and a preliminary stellar wind model for the star is discussed. M.G.

N85-21009*# Observatoire de Paris (France).
AN EPISODIC RED-WING STRUCTURE OF SiIV, LAMBDA 1394A, IN GAMMA CAS
V. Doazan, G. Sedmak, R. Stalio, R. N. Thomas, and A. J. Willis *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 243-248 refs Prepared in cooperation with Osservatorio Astronomico, Trieste, Italy, Institut d'Astrophysique, Paris, and University Coll., London (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

International Ultraviolet Explorer (IUE) observations of gamma Cas obtained in January 1983 show the conspicuous presence of a red-wing structure in the SiIV, 1394 A, resonance line in gamma Cas. The 1403 A, shows a much less enhanced trace of the same effect. A comparison between 1938 IUE spectra with previous ones obtained in 1980 show that in January 1983 the red absorption wing is strongly depressed relative to the 1980 profile where the red feature was absent. It is concluded that this red wing feature is in absorption rather than in emission. This same wing-structure is suggested on 1982 IUE spectra. Combining long-term variations of gamma Cas in the visual with published far-UV data, it is noted that this red feature seems to occur

preferentially at epochs where the V/R ratio of the violet and red emission peaks at H-alpha is less than one. It is suggested that these two characteristics, visual and far UV, are linked to the flow-deceleration in the outer-atmosphere. M.G.

N85-21010*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
IUE AND VOYAGER OBSERVATIONS OF VERY HOT O-TYPE SUBDWARFS
J. S. Drilling, J. B. Holberg (Arizona Univ.), and D. Schonberner (Kiel Univ., West Germany) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 249-253 refs (For primary document see N85-20961 11-89)
(Grants NAG5-71; NAGw-147; NSF AST-80-18766; NSF INT-82-19240)
Avail: NTIS HC A23/MF A01 CSCL 03A

Twelve newly-discovered subdwarf O stars were observed with IUE and complementary observations of two of these were obtained with Voyager 1. It was found that these stars all have effective temperatures of at least 60,000 K and that they occupy a region in the H-R diagram between the hottest white dwarfs and the central stars of planetary nebulae, i.e., that they are the hottest known O-type subdwarfs. Evidence that the abundances of H, He, C, N, and possibly Fe vary widely from star to star is presented. It is believed that these stars represent the state of evolution immediately preceding the white dwarf state, and that the abundance differences are due to diffusion and convective mixing in surface layers. M.G.

N85-21011*# Montreal Univ. (Quebec). Dept. of Physics.
ANALYSIS OF HIGH-DEPRESSION IUE SPECTRA OF SUB-DWARF B STARS
R. Lamontagne, F. Wesemael, G. Fontaine, and E. M. Sion (Arizona State Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 254-257 refs (For primary document see N85-20961 11-89)
(Grants NAG5-343; NSF AST-81-17177)
Avail: NTIS HC A23/MF A01 CSCL 03A

High-dispersion IUE spectra of the subdwarf B stars UV 1758+36 and Ton S-227 are presented. These spectra are characterized by the presence of a large number of photospheric low- and medium-excitation lines from numerous ions. The lines of C, N, and Si are used in conjunction with local thermodynamic equilibrium (LTE) metal line calculations to derive preliminary abundances for these elements. These results are compared and contrasted with those obtained or the hotter OB and O sub-dwarfs. Author

N85-21012*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MASS DISTRIBUTION AND EVOLUTIONARY SCHEME FOR CENTRAL STARS OF PLANETARY NEBULAE
Sara R. Heap and Harry G. Augensen (Widener Univ.) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 258-261 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 04A

New estimates of the initial mass and final mass of central stars of planetary nebulae are presented. A low value of eta is argued. The final masses of central stars were inferred from their positions on an evolutionary diagram which plots optical stellar magnitude vs. kinematic age, as indicated by the radius of the nebula. R.J.F.

N85-21013*# Consiglio Nazionale delle Ricerche, Turin (Italy).
THE CENTRAL STAR OF NGC 40
Luciana Bianchi and Michael Grewing (Astronomisches Inst., Tubingen, West Germany) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 262-265 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

High and low resolution IUE observations of the central star of the planetary nebula NGC 40 is determined. From consideration of the 220.0nm interstellar extinction feature, the reddening towards NGC 40 is determined to be E(B-V)=0.50. The continuum distribution is best fitted with a blackbody emission with temperature between 80,000 and 100,000K. Comparison with existing model atmospheres for WR stars is also discussed. The line spectrum is dominated by strong emission lines from different ionization stages of C. From the high resolution spectrum it was seen that almost all the emission line flux is of stellar origin, as all the lines are extremely broad. P Cygni profiles of the CIV and SiIV resonance lines and of HeII lambda 1640 indicate an expanding wind with a terminal velocity of V(infinity = 1800 K m/s. Author

N85-21014*# Catholic Univ. of America, Washington, D.C. Dept. of Physics.
FURTHER INVESTIGATION OF MASS LOSS PHENOMENA IN HOT WHITE DWARFS AND O SUBDWARFS c90
Frederick C. Bruhweiler *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 269-272 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Previous IUE studies found sharp, shortward-displaced absorption features in two DA white dwarfs (Bruhweiler and Kondo 1981, 1983) and in three O subdwarfs (Bruhweiler and Dean 1983) indicative of mass loss. Anomalous abundances and the presence of subordinate lines, especially in the case of the DA white dwarf, 2111+49, rules out an interstellar origin for these features. Continued analysis of new and archival data added one DA white dwarf and possibly two) subdwarfs to the growing list of sub-luminous stars displaying these features. One, possibly both, of these new O subdwarfs are of extreme low luminosity, intermediate between normal O subdwarfs and the the hot white dwarfs. These observations provide evidence that a single mechanism is responsible for the unusual features seen in O subdwarfs and DA white dwarfs. R.J.F.

N85-21015*# Arizona State Univ., Tempe. Dept. of Physics.
IUE SPECTROPHOTOMETRY OF THE HOT HELIUM-RICH PG1159 DO DEGENERATES
Edward M. Sion, James Liebert (Arizona Univ.), Sumner Starrfield, and F. Wesemael (Montreal Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 273-276 refs (For primary document see N85-20961 11-89)
(Grants NAG5-343; NSF AST-81-17177; NSF AST-83-14788; NSF AST-82-24324)
Avail: NTIS HC A23/MF A01 CSCL 03A

The PG1159 degenerates represent the hottest spectroscopic subgroup of DO stars. Their optical spectra are characterized by broad HeII (lambda 4686) absorption and several transitions of CIV, NIII and CIII. High resolution MMT scans reveal central emission reversals. The discovery of complex, non-radial pulsations in four members of the class underscores the need for accurate temperatures, gravities and abundances for these object. Low resolution IUE spectra of four PG1159 stars, PG1151-029, PG1424+535, PG1520+525 were obtained, as well as an additional image of PG1159-035 and an optical ultraviolet spectrum of PG2131+066. IUE (SWP) spectra suggest the presence of numerous metallic absorption features of CIV (lambda 1550), NV (lambda 1240) and a few unidentified features. The metal absorption lines and HEII (lambda 1640) have equivalent widths of a few angstroms. IUE/optical energy distributions are considered. Tentative identifications of CIV absorptions and possibly, weak OVI features in optical ultraviolet reticon spectra suggest a probable link to the subluminous Wolf-Rayet OV sub 5 I planetary nuclei. The PG1159 DO degenerates are the hottest known (T sub e >100,000K), high gravity (log g > 7) objects. R.J.F.

N85-21016*# California Univ., Berkeley. Dept. of Astronomy.
SELF-CONSISTENT RECALIBRATION OF IUE DETERMINATION OF HOT DA WHITE DWARF EFFECTIVE TEMPERATURES

David S. Finley, Gibor Basri, and Stuart Bowyer *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 277-280 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Using low dispersion short and long wavelength camera observations, the spectra of over twenty stars identified as DA white dwarfs, with temperatures in the range 20,000 to 70,000 K were analyzed. In addition to the IUE data were collected, all other available data on these stars from which temperature estimates may be made. The observed IUE fluxes were compared with the FUV fluxes predicted by using the observed V magnitudes and temperatures obtained from non-IUE data. These comparisons indicate a need to revise the overall IUE calibration by +10% in F sub lambda. The appropriate correction as a function of wavelength was computed, and this correction was applied to the measured IUE fluxes. Temperatures with significantly more accuracy than is achievable with optical photometry were obtained. R.J.F.

N85-21017*# Delaware Univ., Newark. Dept. of Physics.
CARBON, SILICON, AND OXYGEN IN THE WHITE DWARF STAR GD 40
Harry L. Shipman *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 281-284 refs (For primary document see N85-20961 11-89)
(Grants NAG5-348; NSF AST-81-15095)
Avail: NTIS HC A23/MF A01 CSCL 03A

An IUE spectrum of the metal-rich DB white dwarf star GD 40 shows no unequivocal spectra features in the range of the short wavelength prime camera (1200-2000A). This wavelength region contains resonance lines of many common elements: H I, C I, CII, Si II, and O I. Upper limits to the abundances of H, C, Si, and O are derived from model atmosphere calculations. These limits, combined with the detection of Ca II, Mg II, and Fe II, conflict with the predictions of diffusion theories, which were widely invoked to explain the presence of metals in the spectra of the He-rich white dwarf stars. The upper limit to the C abundance indicates that the C abundances in He-rich white dwarfs peak at a temperature of about 12,000 K. Comments are given about how future missions can contribute to further understanding of the chemical compositions of white dwarf stars. R.J.F.

N85-21018*# Arizona Univ., Tucson. Lunar and Planetary Lab.
ANALYSIS OF WHITE DWARF LYMAN ALPHA PROFILES
J. B. Holberg and F. Wesemael (Montreal Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 285-288 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Through the use of a doubly exposed large and small aperture short wavelength prime image it is possible to obtain Lyman alpha profiles for white dwarfs which are relatively free from geocoronal Lyman alpha contamination. For DA white dwarfs the analysis of both wings of these broad profiles yields well-determined temperatures and useful constraints upon surface gravity. Two examples of such an analysis are discussed, and the results compared with temperatures determined from Voyager far UV (912-1150 A) fluxes. R.J.F.

N85-21019*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
A SEARCH FOR WHITE-DWARF COMPANIONS OF SUBGIANT CH STARS
Howard E. Bond *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 289-292 refs Prepared in cooperation with Space Telescope Science Inst., Baltimore (For primary document see N85-20961 11-89)
(Grants NAG5-197)
Avail: NTIS HC A23/MF A01 CSCL 03A

Subgiant CH stars are F- and G-type subgiants and dwarfs showing enhanced carbon and s-process abundances at their surfaces. Their low luminosities are difficult to understand in the context of standard stellar-evolution theory. One possible hypothesis is that subgiant CH stars are the former secondary components of binary systems in which processed material was transferred from a red-giant carbon-star primary; the former primary would now be an optically invisible white dwarf. However, IUE spectra of 21 subgiant CH stars failed to reveal any of the predicted white-dwarf companions. Together with the distribution of these objects in the HR diagrams, the observations suggest that subgiant CH stars are former red giants that, evolving as single stars, underwent violent mixing events that returned them to the vicinity of the main sequence. Nevertheless, many subgiant CH stars (and their probable descendants, the barium and CH stars) are long-period spectroscopic binaries. Results are compatible with the conclusion that the unseen companions are generally unevolved red dwarfs. Apparently the primary components of such wide binaries are, for some as yet unknown reason, prediposed toward violent mixing. R.J.F.

N85-21020*# Washington Univ., Seattle.
THE WHITE DWARF COMPANION OF THE MILD BA STAR XI1 CET
Erika Bohm-Vitense, Charles Proffitt, and Hollis Johnson (Indiana Univ., Bloomington) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 293-296 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The mild Ba star xi(1) Cet was found to have a hot companion. The absolute intensities and the relative energy distribution shows that it is a DA white dwarf with broad absorption bands around 1400 and 1650 A. The temperature is determined to be T sub eff = 13000 plus or minus 1000K. R.J.F.

N85-21021*# Washington Univ., Seattle. Dept. of Astronomy.
THE OUTBURST AND LONG TERM BEHAVIOR OF THE TRIPLE PERIOD CATACLYSMIC VARIABLE TV COL c90
Paula Szkody and Mario Mateo *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 297-300 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

Forty eight IUE spectra and 16 archival spectra of the cataclysmic variable TV Col obtained over a 4 year period were analyzed in order to study variability associated with the orbital period of 5.49(h), the photometric period of 5.19(h) and a longer beat period of 4.024 days. Both the short and long time-scale trends are probably complicated by random variability. The most extreme event occurred in November, 1982 when TV Col underwent an unprecedented 2 magnitude continuum outburst in the UV and optical with large increases in the high excitation lines of HII 1640 and NV 1240. The only repetition timescale apparent from all the data appears to be the 4 day beat period. The flux distributions from UV through 2.2 microns can usually be represented by a power law with F(sub)lambda alpha lambda(-2.3) and a black body component with T near 10,000K. R.J.F.

N85-21022*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
FP CYGNI PROFILES IN HL CMa
J. C. Raymond *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 301-304 refs (For primary document see N85-20961 11-89)
(Grant NAG5-87)
Avail: NTIS HC A23/MF A01 CSCL 03A

The C IV doublet in spectra of the dwarf nova HL CMa shows strong P Cygni profiles during the late rise, peak and decline from outburst maximum. Very high velocity emission wings are seen in some spectra. The N V, Si III and Si II lines generally show blueshifted absorption with very weak emission components.

Models of the ionization state of the wind provide a basis for discussion of the wind geometry. R.J.F.

N85-21023*# Institut d'Astrophysique, Paris (France).
NEW RESULTS ON PU VUL
M. Friedjung, M. Ferrari-Toniolo (CNR, Frascati, Italy), P. Persi (CNR, Frascati, Italy), A. Altamore (Rome Univ., Italy), A. Cassatella (European Space Agency. ESA Tracking Station, Madrid, Spain), and R. Viotti (CNR, Frascati, Italy) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 305-308 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Coordinated UV and IR observations of the nova-like variable PU Vul made during the 1983 September active phase were analyzed. A reddening of E(B-V) = 0.49 is obtained, while the 1980 fading is attributed to absorption by dust formed in the interactive binary system, containing an active warm component and an M giant. R.J.F.

N85-21024*# Arizona State Univ., Tempe. Dept. of Physics.
THE ABUNDANCES OF THE ELEMENTS -CARBON TO SILICON- IN NOVA CORONA AUSTRINA 1981
Sumner Starrfield, Robert E. Williams (Arizona Univ.), Warren M. Sparks (Los Alamos National Lab.), Susan Wyckoff, James W. Truran (Illinois Univ.), and Edward P. Ney (Minnesota Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 309-312 refs (For primary document see N85-20961 11-89)
(Grants NSF AST-81-17177; NSF AST-83-14415)
Avail: NTIS HC A23/MF A01 CSCL 03A

Nova Corona Austrina 1981 was observed systematically over a period of seven months with the IUE satellite. These spectra cover the range 1150-3200 A, and are mostly at low dispersion. The emission lines identified in the low dispersion spectra cover a range in ionization potential from about 8 ev (Mg II) to about 80 ev (N V). Line emission fluxes and widths were measured in all spectra. Several months after maximum visual light, high ionization forbidden lines of sodium, magnesium, and aluminum appeared and then declined over a period of two months. The abundances deduced from these lines imply that nitrogen, oxygen, neon, sodium, magnesium, and aluminum are all enhanced with respect to helium while carbon is not. The observations of this nova, plus the observations of Nova Cygni 1975 and Nova Aquila 1982, imply that some fraction of novae contain white dwarfs that underwent non-degenerate carbon burning prior to entering a close binary-nova phase of evolution. R.J.F.

N85-21025*# Arizona State Univ., Tempe. Dept. of Physics.
HYDRODYNAMIC SIMULATIONS OF RECURRENT NOVAE
c90
Sumner Starrfield, Warren M. Sparks (Los Alamos National Lab.), James W. Truran (Illinois Univ.), and Edward M. Sion *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 313-317 refs Sponsored in part by DOE (For primary document see N85-20961 11-89)
(Grants NSF AST-81-17177; NSF AST-83-14788; NSF AST-83-14415)
Avail: NTIS HC A23/MF A01 CSCL 03B

Simulations of the 1979 outburst of the recurrent nova U Scorpii using a Lagrangian, hydrodynamic computer code which incorporates accretion in the evolution to the outburst are discussed. Three evolutionary sequences were computed in an attempt to understand the very rapid outburst and short recurrence time of this most unusual nova. It is now possible to reproduce the CNO composition of the ejected material, the light curve, the amount of ejected material, and the kinetic energy of the ejecta. The best sequence studied involved accretion of solar rich material onto a 1.38 solar magnatude white dwarf at a rate of 1.6 x 10 to the minus 8 solar magnatude per year. R.J.F.

N85-21026*# Aerospace Corp., Los Angeles, Calif. Space Sciences Lab.
THE UV EXTINCTION OF HR 5999
J. H. Hecht, A. V. Holm (Computer Sciences Corp., Silver Spring, Md.), T. B. Ake, III (Computer Sciences Corp., Silver Spring, Md.), C. L. Imhoff (Computer Sciences Corp., Silver Spring, Md.), N. A. Oliversen (Computer Sciences Corp., Silver Spring, Md.), and G. Sonneborn (Computer Sciences Corp., Silver Spring, Md.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 318-321 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The irregular Ae variable HR 5999 was observed by IUE during a period of minimum light ($7.4 < Mv < 7.7$). By comparing these spectra with spectra of the star taken five years previously near maximum light (Mv approximately 6.9), a UV extinction curve was obtained. The shape of the curve as a function of wavelength does not resemble other extinction curves. A possible cause of the extinction could be 110 nm graphite particles in the star's atmosphere along our line of sight. It is proposed that this star is intermediate as a dust producer between other Ae and T Tauri stars, whose variability appears to be due to spotting, and R CrB variables where dust production is the cause of the light extinction. R.J.F.

N85-21027*# Computer Sciences Corp., Silver Spring, Md.
VARIABILITY OF ULTRAVIOLET EMISSION LINES IN THE CARBON STAR TX PSC
John H. Baumert and Hollis R. Johnson (Indiana Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 322-325 refs (For primary document see N85-20961 11-89)
(Grants NsG-1825; NSF AST-79-13149; NSF AST-82-05800)
Avail: NTIS HC A23/MF A01 CSCL 03A

Multiple observations of the carbon star TX Psc were made. The probable time variations of the Mg II 2800 A line and possible variation of the C II 2325 A line in the spectra of this object are reported. R.J.F.

N85-21028*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEMPORAL UV EMISSION FROM THE PECULIAR STAR RX PUPPIS
M. Kafatos (George Mason Univ.), A. G. Michalitsianos, and John Brugioni (George Mason Univ.) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 326-329 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The peculiar emission star RX Puppis was monitored with the International Ultraviolet Explorer in low and high dispersion. The ultraviolet spectrum of RX Ruppis is characterized by strong permitted and intercombination emission lines similar to that observed in slow novae and symbiotic stars. The absolute emission fluxes of most lines appear to have increased since the first year of observations, during which the reasonance doublet of C IV lambda lambda 1548, 1550 increased by approximately 14 percent. During this period the intensity ratio of the C II I(lambda 1548) I (lambda 1550) typically had values less than unity, and thus exceeded the optically thick limit. Over the several years of observations following maximum UV emission, the doublet ratio appears to be approaching values approximately 1. C IV doublet ratios V1 could be explained by P-Cygni structure in the lambda 1550.7 line, in which the braod absorption component deminishes emission at lambda 1548.2 during ejection. This could imply expansion velocities V500 Km/s. The high dispersion line profile structure in both permitted and intercombination lines appear generally complex and time dependent. R.J.F.

N85-21029*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE FADING OF R CORONAE BOREALIS
A. V. Holm (Computer Sciences Corp.), J. H. Hecht (Aerospace Corp.), C.-C. Wu (Computer Sciences Corp.), and B. Donn *In its*

Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 330-333 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The IUE spectra of R Coronae Borealis (CrB) near the beginning of one of its infrequent minimum is discussed. These spectra show major changes in the apparent spectrum. An attempt is made to identify new features and to interpret the overall change in the continuum in terms of an obscuring cloud model. E.A.K.

N85-21030*# Maryland Univ., College Park.
OBSERVATIONS OF RR LYRAE AND X ARIETIS WITH THE IUE SATELLITE
J. T. Bonnell and R. A. Bell (NSF, Washington, D.C.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 334-337 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Seven low dispersion spectra of RR Lyr and 11 of X Ari were obtained with the long wave redundant camera of IUE. The RR Lyr was also observed in the low-dispersion mode with the SWP camera and in the high-dispersion mode with the LWR camera. The observed fluxes were compared with fluxes calculated by using synthetic spectra and angular diameters determined from photometry at longer wavelengths. The observed fluxes for RR Lyr were found to be significantly fainter than the computed ones. The RR Lyr was also found to be 0.4 magnitudes fainter at 2200A and 2500A during minimum light than it was during previous ultraviolet observations with the ANS satellite. It is suggested that both these differences are due to the star's secondary cycle (the Blazhko effect). One of the high-dispersion exposures made near maximum light was deep enough to reveal the cores of the Mg II h and k lines. No emission was observed and a strong interstellar absorption component was present. Emission features were generally absent from the SWP spectra. An agreement between observed and calculated fluxes was found for X Ari for which no Blazhko effect is observed. E.A.K.

N85-21031*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
ATMOSPHERIC PROPERTIES OF RU LUPI DERIVED FROM HIGH- AND LOW-RESOLUTION IUE SPECTRA
A. Brown, M. V. Penston (Royal Greenwich Observatory, Hailsham, England), R. Johnstone (Royal Greenwich Observatory, Hailsham, England), C. Jordan (Oxford Univ., England), N. P. M. Kuin (Oxford Univ., England), M. T. V. T. Lago, B. Gross, and J. L. Linsky *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 338-341 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

High and low-dispersion IUE spectra of the premain sequence star, RU Lupi, were obtained using both the short wave prime (SWP) and long wave redundant (LWR) cameras. Strong P Cygni line profiles are seen in Mg II and Fe II emission lines, indicating that the lines are formed in the stellar wind of RU Lupi. An increase in transition region line widths is seen with increasing temperature, which cannot be due solely to opacity broadening, thus indicating that kinematic broadening mechanisms are dominant. The transition region density is approx. 3 x 10 to the 10th power cubic cm derived from the Si III lambda1892/C III lambda1909 line ratio. The status of the atmospheric modeling of RU Lupi is discussed. E.A.K.

N85-21032*# Indian Inst. of Astrophysics, Bangalore.
Mg 2 EMISSION OF POP. 2 LONG-PERIOD CEPHEIDS
M. Parthasarathy and Sidney B. Parsons (Computer Sciences Corp.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 342-434 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The population II Cepheid pulsational variables AL Vir (P = 10.3 days) and W Vir (P = 17.3 days) were observed with IUE at two phases each. Only low dispersion mid-UV exposures were feasible, but were sufficient to show a great range in Mg II emission behavior. The relationship to phase variation of emission in classical (Pop. I) Cepheids of long period is unclear. E.A.K.

N85-21033*# Washington Univ., Seattle.
BLUE COMPANIONS OF CEPHEIDS
Erika Bohm-Vitense and Charles Proffitt *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 344-347 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Nineteen Cepheids, known or suspected to have blue companions, were observed. For 11 of them, blue companions were seen, though many of them were fainter in the UV than suspected. For four population I Cepheids the suspected companions were not seen. For none of the population II Cepheids could a companion be detected. For the observed companions T(eff) luminosities and masses from their position in the HR diagram are determined. E.A.K.

N85-21034*# Washington Univ., Seattle.
ULTRAVIOLET OBSERVATIONS OF POPULATION 2 CEPHEIDS
Erika Bohm-Vitense, Charles Proffitt, and George Wallerstein *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 348-351 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The two population II Cepheids, ST Pup and W Vir, have nearly the same length of period and B-V colors, yet spectral types are very different, indicating large differences in metal abundances. Metal abundances, T(eff) and the color excess from the observed discontinuities at 1700 A, at 2600 A, the ultraviolet to visual colors, and the 2400 A absorption band were determined. The observations for ST Pup were made shortly after maximum light. For ST Pup we found E(B-V) = 0.2, T(eff) - 6600 + 100K at 0.5 days after maximum. A metal abundance of (A/H) = -1.7 + or - 0.2 were determined. For W Vir a metal abundance of (A/H) approx. -0.9 is suggested. E.A.K.

N85-21035*# Washington Univ., Seattle.
ULTRAVIOLET ANALYSIS OF THE PECULIAR F SUPERGIANT HD 112374
Erika Bohm-Vitense and Charles Proffitt *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 352-354 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The ultraviolet energy distribution of the metal-poor supergiant HD 11234 was studied. A temperature T(eff) = 5500+ 100K, log g = -0.3 + or - 0.3 and a metal deficiency of Log Z/Z (solar) = -0.7 are needed to find agreement between theoretical and observed ultraviolet energy distributions with a reddening of E(B-V) < or = 0.1, consistent with its galactic latitude of +36 deg. E.A.K.

N85-21036*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACCRETION IN THE ZETA AURIGAE AND 32 CYGNI SHOCK CONES
I. A. Ahmad (Imad-ad-Dean, Inc., Bethesda, Md.), R. D. Chapman, R. Stencel (NASA, Washington, D.C.), and Y. Kondo *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 357-360 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Zeta Aurigae and 32 Cygni are binary stars consisting of a cool supergiant primary and a hot dwarf secondary. Variations in the Mg II 2800 A and C IV 1550 A doublets of these stars near the time and secondary minimum were observed. Longward-shifted absorption is seen in the Mg II lines of both stars which may be due to material accreting onto the B star behind the shock front. A reverse P-Cygni profile in the C IV lines at some phases of zeta Aur was observed. This phenomenon seems transient and

recurrent, and may suggest streaming. An abrupt strengthening and broadening of the absorption-especially at higher positive radial velocities-manifested in the CIV lines coincides with the onset and termination of the Mg II accretion absorption. It is suggested that this is the effect of the abrupt increase in optical depth as the line of sight aligns with the shock front. For 32 Cygni the observed aberration angle is similar to that of zeta Aur, but the system seems more diffucult to model. For zeta Aur the angle of aberration of the accreting material from the radial direction is about 38 deg. and the half width of the shock cone is about 11 deg. For 32 Cygni the aberration angle is about 44 deg. E.A.K.

N85-21037*# Computer Sciences Corp., Silver Spring, Md. Astronomy Operations.

ECLIPSE OBSERVATIONS OF EPSILON AURIGAE

Thomas B. Ake, III and Theodore Simon (Hawaii Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 361-364 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

The major characteristics in the UV of the 1982 to 84 eclipse of Zeta Aur, from first through third contact are summarized. From 1500 to 3200 A, the spectrum is dominated by periodic changes in continuum levels, apparently due to Cepheid-like pulsation of the primary, superimposed upon the decrease in light due to the eclipse itself. No large increase in the 2200 A dip is found, so that if the cool disk is comprised of cool dust grains, they must be larger than typical interstellar grains. Comparison with other A-F supergiants are inconclusive whether a hot companion is seen, although excess UV flux is present shortward of 1400 A. The only strong emission lines in the UV are 0 I 1304 and Mg II 2800. The O I is present outside of eclipse and shows variations of a factor of two during totality. The absence of strong eclipse effects on it leaves some doubt as to whether it arises from the F-type primary, the secondary, or intrasystem gas. The Mg II emission, which was unveiled as the F-star continuum decreased on ingress, developed a broad, blue-shifted component of -300 k/s, which is speculated that it may be a signature of accretion by the secondary of gas ejected by the primary. E.A.K.

N85-21038*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

UV OBSERVATIONS OF EPSILON AURIGAE DURING INGRESS AND TOTALITY

Bruce M. Altner (Applied Research Corp.), Robert D. Chapman, Yoji Kondo, and Robert E. Stencel (NASA, Washington, D.C.) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 365-368 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

Analysis of short wavelength prime camera (SWP) and long wavelength redundant camera (LWR) spectra of Epsilon Aurigae taken during the preeclipse, ingress and total phases of the present eclipse has provided further constraints on models of this enigmatic system. High dispersion images show no significant change in the strength of the Mg II emission lines during the course of the eclipse. Both high and low dispersion spectra indicate that the eclipse starts earlier, ends later and is deeper in the UV compared to visual wqvelengths. The earlier observation that the eclipse depth is wavelength dependent shortward of 2400 A is confirmed. Abrupt changes in the light curve appear at all wavelengths, suggestive of discontinuities in the opacity of a ring of material surrounding the secondary object. E.A.K.

N85-21039*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EGRESS SPECTRA OF THE NEW ECLIPSING SUPERGIANT 22 VULFECULAE

Thomas B. Ake, III (Computer Sciences Corp., Silver Spring, Md.), Sidney B. Parsons (Computer Sciences Corp., Silver Spring, Md.), and Yuji Kondo *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 369-372 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

The G-type primary in the single-lined spectroscopic binary 22 Vul (HD 192713, G3p Ib-II, period 249 days) was found with IUE in April 1983 to eclipse its recently identified b9 main sequence companion. The system joins the few known Zeta-Aurigae systems in which a hot dwarf can be used to probe the extended atmosphere of a cool supergiant. Outside of eclipse, a wind from the system with terminal velocity of 300 k/s is conspicuous in the Mg II lines. Enhanced Fe II absorption seen well away from geometrical eclipse implies an extensive envelope around the G-star. Some of the 22 Vul spectra closely resemble those of other interacting binaries, which suggests common properties of relatively dense, warm plasmas in these systems. E.A.K.

N85-21040*# Toledo Univ., Ohio. Astrophysical Research Center.

THE STELLAR WIND IN THE BO V-TYPE ECLIPSING BINARY Y CYGNI **c90**

N. D. Morrison and C. D. Garmany (Joint Inst. for Lab. Astrophysics) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 373-376 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03B

The double lined eclipsing binary system Y Cygni (HD 198846) has well determined orbital elements, absolute dimensions, and rate of apsidal motion. In several high-dispersion short wavelength primary camera (SWP) images taken near eclipse and in one at quadrature, the profiles of the resonance lines of Si IV, C IV, and N V were studied. The C IV is very broad, and the absorption minima are shortward shifted by 160 km/s with respect to Si IV. The N V is weak but is shortward shifted by a similar amount and has a broad shortward wing. In general, the spectrum is similar to that of the single BO V-type star tau Scorpii. In the spectrum obtained at quadrature, the C IV profile is shifted in accordance with the orbital motion of the hotter, less massive star. It is likely that the wind-borne C IV absorption originates in this star. By fitting the C IV and N V lines with synthetic profiles computed from the program written by Oslon, a terminal velocity of 1500 km/s was obtained. E.A.K.

N85-21041*# Los Alamos Scientific Lab., N. Mex.

OBSERVATIONS OF CATACLYSMIC VARIABLE STAR WINDS

Frane A. Cordova and Keith O. Mason (Mullard Space Science Lab.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 377-381 refs Sponsored in part by DOE (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

High velocity winds are common among cataclysmic variables stars (CVs) with luminous accretion disks. What was learned about these winds from IUE spectrophotometry is summarized. The IUE discovered that under some conditions CVs exhibit high-velocity winds. These close binary systems can potentially offer much information about the driving mechanisms of winds in general because: (1) the orbital elements of many of these binaries and their geometry is well understood, allowing the spectral line profiles to be, studied as a function of inclination and stellar mass; and (2) changes in the luminosity of these stars are dramatic and, in some cases, fairly predictable, so that the effect on the winds of changes in the radiation field can be studied. E.A.K.

N85-21042*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ULTRAVIOLET SPECTROSCOPY OF THE INTERACTING BINARY U SAGITTAE

George E. McCluskey, Jr. (Lehigh Univ.) and Yuji Kondo *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 382-386 refs (For primary document see N85-20961 11-89)

(Grant NsG-5386)

Avail: NTIS HC A23/MF A01 CSCL 03A

The interacting Algol-type binary U Sagittae was observed with the International Ultraviolet Explorer (IUE). Eleven high resolution

spectra in the far-ultraviolet and nine high resolution spectra in the mid-ultraviolet were obtained during one orbital cycle in June 1983. The resonance lines of Si IV and C IV are present in absorption of moderate strength at all observed phases. It is assumed that the resonance lines of N V are present at several phases. The presence of Si IV and C IV indicates the existence of regions considerably hotter than a normal B8 V photosphere and are visible at all of the observed phases. The existence and behavior of these features suggests that a hot pseudo-photosphere is created around the B8 star by matter flowing from the G-type companion. E.A.K.

N85-21043*# University of Southern California, Los Angeles. Dept. of Astronomy.
ULTRAVIOLET OBSERVATIONS OF CIRCUMSTELLAR MATTER IN ALGOL TYPE BINARY SYSTEMS
Geraldine J. Peters and Ronald S. Polidan (Arizona Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 387-390 refs (For primary document see N85-20961 11-89)
(Grant NsG-5422)
Avail: NTIS HC A23/MF A01 CSCL 03A

Properties of four components to the circumstellar matter in Algol type interacting binary systems which were investigated with the aid of timed high resolution IUE observations are discussed. The high temperature accretion region (HTAR), gas stream, restricted domains of material outflow, and the general wind are included. The geometrical distribution in the system, physical conditions, flow patterns, and stability are discussed. The CX Dra serves as the illustrative example and a model for the circumstellar matter in this system is presented. E.A.K.

N85-21044*# National Central Univ., Chung-Li (Taiwan). Inst. of Physics and Astronomy.
THE ESSENCE OF BINARY STAR COALESCENCE: A COORDINATED GROUND-BASED PHOTOMETRIC AND IUE ULTRAVIOLET STUDY OF FK COMAE **c90**
J. D. Dorren and E. F. Guinan (Villanova Univ., Pa.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 391-395 refs (For primary document see N85-20961 11-89)
(Grant NAG5-382)
Avail: NTIS HC A23/MF A01 CSCL 03B

The FK Comae is a rapidly rotating approx. G5 giant which has very strong and variable chromospheric and transition region line emissions, similar in number and strength to those observed for the most active RS CVn stars. It is also a variable star which has low amplitude, quasisinusoidal light variations with period of approx. 2.40 days. As in the case of RS CVn variables, these light variations were modelled with dark star spots. In addition, energetic flare-like events were observed spectroscopically and photometrically. Radial velocity observations fail to reveal that FK Comae is a close binary system which could account for its rapid rotation through tidal synchronization. Since radial velocity observations have failed so far to reveal any evidence that FK Comae is a close binary, it is suggested that the star was once a binary system that now has coalesced into a single, rapidly rotating star. The evolutionary models of Webbink (1976) suggest that W Ursae Majoris binaries coalesce after going through the contact stage of their evolution. It is also suggested that the very broad H-alpha feature observed in FK Comae originates in the excretion disk expected in Webbink's scheme. E.A.K.

N85-21045*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRANGE F + Be BINARY STAR SYSTEMS **c90**
Sidney B. Parsons (Computer Sciences Corp.), Bernard W. Bopp (Toledo Univ., Ohio), and Yoji Kondo *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 396-399 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

The IUE spectra of five stars with F or F + B optical spectra and strong Be star-like H alpha emission were obtained on several dates. No two exposures of the strange optical variable HD 37453 are quite alike, Mg II emission is strong, and the short wave prime (SWP) region has some resemblance to known interacting binaries such as SX Cas. The HD 43246 shows significant Si IV absorption against an otherwise normal late B-spectrum. The HD 166612 shows early B main-sequence spectral features except for evidence of a strong stellar wind. The HD 207739, discovered in 1982 to show UV characteristics of a strongly interacting system, showed general brightening in the September observations, opposite to the visual flux which decreased slightly. The far-UV spectrum of HD 207739 was seen to evolve but to remain in between the two extremes seen in 1982, which differed greatly both in character and in absolute flux. E.A.K.

N85-21046*# National Aeronautics and Space Administration, Washington, D. C.
MULTI-YEAR AND POSSIBLY PERIODIC VARIATIONS IN THE UV SPECTRUM OF 56 PEGASI
Robert E. Stencel, James E. Neff (Colorado Univ.), and Robert D. McClure (Dominion Astrophysical Observatory) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 400-403 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Radical variations in the Mg 2 emission profile of the late type supergiant 56 Peg were observed to occur during the course of five years of IUE operations. Pronounced and possibly periodic changes in asymmetry, emission relative velocity and photospheric radial velocity are reported. Implications for the study of cool star chromospheres and interacting binaries are discussed. Autho

N85-21047*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
THREE SHORT-PERIOD BINARIES SEEN AT HIGH-DISPERSION UX ARI, IOTA TRI AND HA5110
Irene R. Little-Marenin, Thomas R. Ayres (Colorado Univ., Boulder), and Theodore Simon (Hawaii Univ., Honolulu) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 404-407 refs (For primary document see N85-20961 11-89)
(Contract NAS5-26409; Grants NAG5-199; NAG5-146)
Avail: NTIS HC A23/MF A01 CSCL 03A

The three short-period binary systems UX Ari (P=6.43791 days), iota Tri (P=14.732 days) and RH5110 (P=2.61328 days) represent three different evolutionary stages: (1) an evolved subgiant primary with a secondary still on the main sequence (UX Ari); (2) two evolved G giants that appear to be crossing the Hertzsprung gap for the first time together (iota Tri); and (3) an evolved subgiant that fills its Roche lobe and has lost mass to the secondary to the point where the original secondary is now about 3.5 times as massive as its evolved KOIV companion (HR5110). All three systems show strong UV emission lines indicative of plasmas ranging in temperature from 6000K to 20,000K. X-ray emission was detected from UX Ari and HR5110 indicating hot coronae. The chromospheric, transition region and coronal activity appears to be related primarily to the rotational velocity of the stars (but also to other parameters such as the depth of the convection zone). High-dispersion short-wavelength as well as long-wavelength IUE spectra of all three systems were analyzed. B.W.

N85-21048*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
PHYSICAL MODELS FOR THE UV CONTINUA OF SYMBIOTIC STARS
Scott J. Kenyon *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 409-411 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Low resolution IUE spectra represent a unique opportunity to examine the hot component in a symbiotic binary. Reddening-free color indices were developed which serve to identify the nature of the hot components in these interesting systems. The hot

components are divided into two categories: (1) accreting main sequence stars; and (2) hot stellar sources. Symbiotic stars are therefore not a homogeneous group of variables, and at least two formation mechanisms are needed to produce the observed sample. Author

N85-21049*# California Univ., Los Angeles. Dept. of Astronomy.
THE ECLIPSING BINARY U SAGITTAE: EVIDENCE FOR CNO PROCESSING AND MASS EXCHANGE IN THE PAST
Jan J. Dobias and Mirek J. Plavec *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 412-415 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The system parameters of U Sagittae were determined. The components are of spectral types B7.5 5 and G4 4-3, and the system is at a distance of approximately 290 pc. It was confirmed that the masses are about 5.5 and 1.9 solar masses, respectively. The system is a typical semidetached system of the Algol type, but it is almost completely dormant, with only the barest traces of circumstellar material. The photospheric lines of the hotter star were studied in detail. The abundance of carbon is only 9% of its solar abundance, and N is overabundant by a factor of 4.5. It is concluded that the system underwent large mass transfer. B.W.

N85-21050*# Consiglio Nazionale delle Ricerche, Turin (Italy).
IUE AND OPTICAL OBSERVATIONS OF LMC X-RAY BINARIES
Luciana Bianchi and Manfred Pakull (Technische Univ., Berlin, West Germany) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 416-419 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The first IUE observations of two LMC X-Ray binary candidates, LMC X-1 (star 32) and 1E0501.8 (Sk-7036) are presented. Both sources were observed with IUE at two phases of the optical light curve, to search for possible effects of the X-Ray flux on the primary's wind. From consideration of the 220.0nm interstellar extinction dip and of the overall continuum distribution, the foreground reddening was derived to be E(B-V) = 0.05. The additional reddening in the LMC was derived to be E(B-V)=0.11 for Sk-7036 and E(B-V)=0.32 for LMC X-1. The spectra of Sk-7036 show a significant variation of the continuum, the flux at 1300A being stronger at phase 0.2 by 40% compared to the flux observed at a minimum of the light curve. The latter can be represented by a model atmosphere with Teff=25000K, log g = 3.0, in agreement with the spectral type derived from the optical colors. The UV continuum of star 32 (LCM X-1) can be modeled with Teff=35000K, log g = 3.5, which is appropriate for an 07-9 giant. B.W.

N85-21051*# California Univ., Los Angeles.
CIRCUMSTELLAR MATERIAL IN ALGOLS AND SERPENTIDS
Mirek J. Plavec, Jan J. Dobias, Paul B. Etzel, and Janet L. Weiland *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 420-423 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The observations of the emission lines of C 4, N 5, Si 4, etc. in interacting binaries of the Algol and W Serpentid types are reviewed. So far, seven Serpentid are known, and seven bona fide Algol-type semidetached systems were found to display the same kind of emission lines, only on a weaker scale. Interesting differences are observed in both the absolute and relative strengths of the emission lines. In some systems, the C 4 resonance doublet is the strongest, while in others, the N 5 doublet is definitely stronger. The main cause of this dichotomy is suspected to be the varying degree of CNO processing of the observed material. But the variable ratio of the strength of the C 2 line to that of the C 4 line suggests temperature differences between the emitting regions of the individual systems, too. Author

N85-21052*# California Univ., Los Angeles. Dept. of Astronomy.
MU SAGITTARII AND BETA LYRAE: COMBINED IUE/VOYAGER OBSERVATIONS
Mirek J. Plavec and Ronald S. Polidan (Arizona Univ., Tucson) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 424-427 (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

A hot companion to the B8 Ia supergiant mu Sagittarii was discovered by observations with three satellites: Copernicus, IUE, and Voyager. The companion is probably a B2 V star, but could be as hot as B0. Voyager observations in he region 900 - 1700 A of beta Lyrae, show that the disk-shaped secondary is the dominating source in the EUV. B.W.

N85-21053*# Computer Sciences Corp., Silver Spring, Md.
A SEARCH FOR THE SPECTROSCOPIC BINARY COMPANIONS OF POLARIS USING IUE SPECTRA
Nancy Remage Evans *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 428-431 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Polaris has a spectroscopic orbit from an extensive series of observations as well as more uncertain astrometric elements. IUE low dispersion spectra were searched for any light from a companion by forming ratios with observations of stars with spectral types similar to Polaris. There is no sign of a companion as early as A7V. Mass limits are discussed. B.W.

N85-21054*# Manchester Univ. (England). Dept. of Astronomy.
TASKS FOR OBSERVATIONS OF CLOSE BINARY SYSTEMS IN THE EXTREME ULTRAVIOLET
Zdenek Kopal and Jurgen Rahe (Erlangen-Nurnberg Univ., West Germany) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 432-436 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The problem of observability of known eclipsing binary systems in the extreme ultraviolet with present spacecraft detectors is investigated. The need for spacecraft operating above the atmosphere and utilizing detectors which remain sensitive down to the Lyman limit at lambda 912 A is discussed. B.W.

N85-21055*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary, and Atmospheric Sciences.
THE SOLAR STELLAR CONNECTION IN THE FAR ULTRAVIOLET c90
J. O. Bennett, T. R. Ayres, and G. J. Rottman *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 437-440 (For primary document see N85-20961 11-89)
(Grant NAG5-199)
Avail: NTIS HC A23/MF A01 CSCL 03B

The far ultraviolet activity of solar type stars, as measured with the IUE are compared to that of the Sun, as measured by the Solar Irradiance Monitor of the Solar Mesosphere Explorer. The relationships between the ultraviolet activity at different levels of the atmospheres of solar type stars were explored. Diagrams were produced that depict correlations of fluxes of ultraviolet emission lines formed at different temperatures in the stellar outer atmosphere. Secondary goals were to establish, quantitatively, the strength of the solar ultraviolet activity within the class of solar type stars and to examine the amplitudes of rotational modulations of the solar emission lines during the declining portion of the current sunspot cycle. B.G.

N85-21056*# Carnegie Institution of Washington, D. C.
CHROMOSPHERIC ACTIVITY IN M GIANTS
Thomas Y. Steiman-Cameron, Hollis R. Johnson (Indiana Univ.), and R. Kent Honeycutt (Indiana Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years

of IUE Res. Dec. 1984 p 441-444 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Low resolution IUE spectra were obtained for fifteen cool giant stars ranging in spectral type from K4.8 thru M5.9. These spectra were used to examine chromospheric activity and to evaluate the extent to which nonradiative heating affects the upper levels of cool giant photospheres. The stars were chosen because of their well determined wide band colors, TiO band strengths (from wing photometry), angular diameters (determined from lunar occultations), apparent bolometric fluxes as seen from Earth, and effective preliminary analysis of these observations is presented. B.G.

N85-21057*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
A PROGRESS REPORT ON THE ANALYSIS OF LONG EXPOSURE SWP HIGH RESOLUTION SPECTRA OF COOL STARS
J. L. Linsky, T. R. Ayres (Colorado Univ., Boulder), A. Brown, K. G. Carpenter, C. Jordon (Oxford Univ., England), P. Judge (Oxford Univ., England), B. Gustafsson (Uppsala Univ., Sweden), E. Eriksson (Uppsala Univ., Sweden), M. Saxner (Uppsala Univ., Sweden), and O. Engvold (Oslo Univ., Norway) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 445-449 refs (For primary document see N85-20961 11-89)
(Grants NAG5-82; NGL-06-003-057)
Avail: NTIS HC A23/MF A01 CSCL 03A

The IUE is the first experiment with sufficient sensitivity to obtain high resolution spectra (lambda/delta lambda is approximately 10,000) of many cool stars in the vitally important 1200 to 2000 A spectral region. These data provide qualitatively new information with which to understand the properties of and structures in the outer atmospheres of these stars. Also, these cool star spectra will be extremely useful in planning for the Space Telescope High Resolution Spectrograph, which will be 1000 times more sensitive than IUE but will be hampered by limited observing time and limited spectral bandwidth in each exposure. Very long exposure, high disperson SWP spectra of many stars located throughout the cool half of the HR diagram were obtained. These 12 to 21 hour exposures were obtained by combining NASA and Vilspa shifts so as to obtain the longest possible exposures at times of low background. Included are dwarf stars of spectral type G0 V to M2 V, G9.5 III to M5 II giants, G2 Ib to M2 Iab supergiants, a number of RS CVn-type systems, and Barium stars. B.G.

N85-21058*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
CHROMOSPHERIC EMISSION LINES IN HIGH-RESOLUTION LWR SPECTRA (220 - 3000 ALPHA) OF GAMMA CRU (M3 3) AND ALPHA ORI (M2 IAB)
Kenneth G. Carpenter *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 450-453 refs (For primary document see N85-20961 11-89)
(Grant NAG5-82)
Avail: NTIS HC A23/MF A01 CSCL 03A

The identity and characteristics of the chromospheric emission features in the 2200 to 300 A region of high resolution spectra of the stars gamma Cru and alpha Ori are summarized. The velocities, fluxes, and asymmetries of a set of Fe II lines which share common upper or lower energy levels are discussed and the information gained from flux measurements of the C II (UV 0.01) lines is presented. The Fe II lines in the alpha Ori spectra indicate the general shape of the velocity versus radius relation in its wind. The C II (UV 0.01) data are combined with measures of the C II (UV 1) flux to estimate the electron density and temperature in the wind and the geometric extent of the C II emitting region in both stars. Author

N85-21059*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
ACTIVE LATE-TYPE STARS AND THE APPLICABILITY OF CORONAL LOOP MODELS
Mark S. Giampapa, L. Golub, G. Peres, S. Serio, and G. S. Vaiana *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 454-457 refs (For primary document see N85-20961 11-89)
(Grant NAG5-87)
Avail: NTIS HC A23/MF A01 CSCL 03A

Far ultraviolet IUE observations of a sample of solar type stars were combined with existing soft X-ray measurements obtained by HEAO B. The resulting data set was utilized and a new coronal loop model numerical code was developed to perform a preliminary investigation of the applicability of coronal loop models to solar-type stars. Reasonable agreement was found to exist between the predictions of single-component coronal loop model atmospheres. It was demonstrated that semi-empirical, coronal loop models can be applied to account for observed stellar transition region and coronal emission. This result is corroborative evidence for the presence of magnetic field structures analogous to solar coronal loops on the surfaces of solar-type stars. It is suggested that stellar transition region emission arises predominantly from the base of quiescent coronal loop configurations. R.S.F.

N85-21060*# Franklin Inst., Newark, Del.
CO-ROTATING INTERACTION REGIONS IN STELLAR WINDS
D. J. Mullan *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 458-461 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

A co-rotating interaction region (CIR) forms in a stellar wind when a fast stream from a rotating star overtakes a slow stream. CIRs were studied in detail in the solar wind over the past decade. Their usefulness in interpreting several spectroscopic features in stars of various types, including hybrid stars, OB stars, and cool supergiants is discussed. Author

N85-21061*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BETEGEUSE AT MAXIMUM LUMINOSITY
A. K. Dupree (Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.), G. Sonneborn, S. L. Baliunas (Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.), E. F. Guinan (Villanova Univ., Pa.), L. Hartmann, and D. p. Hayes (Columbia Univ., New York) *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 462-467 refs (For primary document see N85-20961 11-89)
(Grant NAG5-87)
Avail: NTIS HC A23/MF A01 CSCL 03A

Betelgeuse (Alpha Ori; M2 Iab) was extremely bright at optical wavelengths and in the Mg II resonance lines during January and February 1984 when an intrinsic brightening occurred in the photosphere and chromosphere. Linear polarization in the B-band at this time was not anomalous when compared to earlier epochs. The core of the H-alpha line was redshifted by about 10 km/s with respect to the photospheric lines during January/February as compared to measurements made 5 months previously. There may be periodic variations in the chromospheric flux. E.A.K.

N85-21062*# Colorado Univ., Boulder. Atmospheric and Space Physics Lab.
PRECISE MEASUREMENTS OF RADIAL VELOCITIES OF EMISSION LINES IN THE FAR-ULTRAVIOLET SPECTRA OF LATE-TYPE STARS
T. R. Ayres, O. Engvold (Oslo Univ., Norway), D. Kjeldseth Moe (Oslo Univ., Norway), T. Simon (Hawaii Univ., Honolulu), C. Jordan (Oxford Univ., England), P. Judge (Oxford Univ., England), A. Brown (Joint Inst. for Laboratory Astrophysics, Boulder, Colo.), and J. L. Linsky (Joint Inst. for Laboratory Astrophysics, Boulder, Colo.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 468-471 Sponsored in part by NASA, SERC, and ESA (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The radial velocities of emission lines in deep short wave prime camera echelle exposures of several late-type dwarf and

giant stars were measured. The goal was to search for absolute and differential Doppler shifts of emission lines formed at different temperatures in the stellar outer atmospheres analogous to the redshifts of C IV lambda 1548 (10 to the 5th power K) which occur in the solar transition zone. Existing images, taken without the precise radial velocity precautions, of five dwarf stars, four giant stars, and three supergiants are reanalyzed. E.A.K.

N85-21063*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
ULTRAVIOLET, RADIO AND X-RAY OBSERVATIONS OF HYBRID STARS
Stephen A. Drake, Alexander Brown, and Jeffrey L. Linsky *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 472-475 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

The Mg II profiles of hybrid stars (obtained from spectra available in the IUE Archives of the Univ. of Colorado RDAF) were reanalyzed. Radio observations of 3 hybrid stars (iota aur, theta Her and gamma Aq1) are presented and the available Einstein X-ray data on these stars are discussed. This observational material is compared with the properties of the HDR model for hybrids that could form both low- and high-velocity Mg II absorptions in the extending circumstellar envelope predicted no X ray emission. From the analysis it is conducted that interstellar absorption is sufficient to account for the observed low-velocity features, so that only the high-velocity absorptions are formed in the winds themselves. What makes the kinematics of hybrid stellar winds interesting are the observed high wind velocities (70 km to 140 km) compared to other G-K I III stars and not the supposed twin circumstellar absorptions. A.R.H.

N85-21064*# National Aeronautics and Space Administration, Washington, D. C.
ROTATIONAL MODULATION OF CHROMOSPHERIC EMISSION IN COOL GIANTS AND HYBRID STARS
J. W. Brosius (Franklin Inst., Newark, Del.), D. J. Mullan (Franklin Inst., Newark, Del.), and R. E. Stencel *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 476-482 refs (For primary document see N85-20961 11-89)
(Grant NAG5-378)
Avail: NTIS HC A23/MF A01 CSCL 03A

IUE archival data were used to study temporal variations of the MGII h and k emission lines in 8 late-type giants. Evidence that the variations are periodic in nature is presented. It is argued that the periodicities can be interpreted in terms of rotation. The four fastest rotators in the sample are found to be hybrid stars. Author

N85-21065*# Washington Univ., Seattle. Dept. of Astronomy.
ULTRAVIOLET AND OPTICAL SPECTROSCOPY AND POLARIMETRY OF THE HELIUM WEAK STAR HD 21669: EVIDENCE FOR A MAGNETICALLY CONTROLLED STELLAR WIND
Douglas N. Brown, Steven N. Shore (Case Western Reserve Univ., Cleveland, Ohio), C. T. Bolton (Toronto Univ.), Stephen J. Hulbert (Case Western Reserve Univ., Cleveland, Ohio), and George Sonneborn (Computer Scienes Corp.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 483-486 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

High dipsersion SWP spectra with IUE, and contemporaneous optical Zeeman polarimetry and spectroscopy of the helium weak star HD 21699 = HR 1063 were obtained. All IUE observations were made during Sept. 1983 and Feb. 1984. The C IV 1548,1550 doublet varies on a timescale consistent with the photometric and magnetic period, while no other strong lines in the UV display obvious variations in profile or strength. Only the helium weak star HD 5737 = alpha Scl shows a similarly strong C IV line among the helium weaks. This set of observations is discussed in the context of a magnetic star which is losing mass, having constrained that outflow to corotate with the stellar surface. If the magnetic period is correct, the greatest mass outflow seems to be from above the polar regions. The comparison between optical and UV spectrum phenomenology is also considered. Author

N85-21066*# Washington Univ., Seattle. Dept. of Astronomy.
MAGNETOSPHERES AND WINDS IN THE HELIUM WEAK STARS: OBSERVATIONS OF C 5 IN UPPER MAIN SEQUENCE CP STARS **c90**
Douglas N. Brown, Steven N. Shore (Case Western Reserve Univ., Cleveland, Ohio), Paul K. Barker (Univ. of Western Ontario, London), and George Sonneborn (Computer Sciences Corp., Greenbelt, Md.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 487-490 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

A sample is presented of eleven helium weak and Si stars, observed at high dispersion. These are HD 7537, 21699, 28843, 34452, 125823, 131120, 142301, 142990, 144334, 175362 AND 215441. The stars span the range B2.5 to B6 and include both magnetic and nonmagnetic as well as rapid and slow rotators. In the two stars designated sn by Abt, the C IV profile is strong (HD 5737 and 21699) while all of the other stars can be explained by numerous blended lines of Fe III and similar ions. Most of the stars were observed several times, and only HD 21699 appears to show large amplitude spectral variations. Author

N85-21067*# Warner and Swasey Observatory, Cleveland, Ohio.
IUE SPECTROPHOTOMETRY OF HELIUM WEAK AND SILICON STARS
Steven N. Shore and Douglas N. Brown (Washington Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 491-496 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

A sample of helium weak stars was surveyed using the low dispersion SWP and LWR cameras of IUE during 1983 to study systematics of the broad continuum feature at 1400 A as a function of effective temperature, spectral anomaly and age. For the Orion association, there are five stars (HD 35456, 36313, 36526, 36668, 37140); for Sco-Cen, there are two (HD 142301 and 144334); and for Alpha Per, there is one (HD 21699). The range from B2 to B6 is covered. Only HD 34452, the most extreme silicon star in the sample, has a very strong 1400 feature. Author

N85-21068*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
THE SPATIAL DEPENDENCE OF THE JOVIAN AURORAL EMISSIONS **c91**
T. E. Skinner, H. W. Moos, and G. E. Ballester *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 497-498 refs (For primary document see N85-20961 11-89)
(Grant NsG-5393)
Avail: NTIS HC A23/MF A01 CSCL 03B

The intensity of the north pole emissions shows a marked variation with central meridian longitude lambda CML (System III [1965] coordinates), rising to a maximum near lambda CML = 185 deg and then falling again toward zero. Because the spatial resolution in the large aperture of the short-wavelength spectrograph is not sufficient to resolve the actual auroral zone, the amount of the auroral oval contained within the aperture as a function of lambda CML cannot be explicitly determined from the observations. The observations were modeled on the basis of the geometry and the intensity of the emissions using two auroral zones taken from an O4 plus current sheet model. The observed variation in flux with lambda CML was shown to be inconsistent with a uniform brightness as a function of longitude in either the torus or the magnetotail auroral zones. Preliminary results of three observations of the south pole aurora show a definite variation in the emission flux with lambda CML. The maximum flux of the observations varies by an overall factor of 2, with a factor of approximately 1.5 deg variation within a 2-day period. A.R.H.

N85-21069*# State Univ. of New York, Stony Brook. Dept. of Earth and Space Science.
THE JOVIAN STRATOSPHERE IN THE ULTRAVIOLET Abstract Only c91
Richard Wagener and John Caldwell *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 129-132 (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

The center-of-disk reflectivity of Jupiter in the wavelength range from 1500 A to 3000 A was computed from 31 low dispersion IUE spectra taken during solar maximum in 1979/80. The spectra were normalized to a reflectivity scale with the improved solar spectrum of July, 1980. Consideration of wavelength shifts between different IUE spectra and within the solar spectrum improved the apparent noise, especially longward of 2000 A. Six out of seven ammonia bands between 1900 A and 2200 A were detected. A vertically inhomogeneous radiative transfer program is used to compute model reflectivities for various stratospheric compositions. In addition to ammonia, the abundance of acetylene is also well determined because these molecules show narrow absorption bands in the ultraviolet. The abundances of the other molecules in the models (C3H4, C2H4, C4H2, C2H6, C3H6) are very uncertain and therefore are quoted only as upper limits. The best model fit is consistent with infrared observations by Voyager IRIS. Author

N85-21070*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
LONG TERM VARIABILITY OF THE IO TORUS Abstract Only c91
H. W. Moos, T. E. Skinner, P. D. Feldman, S. T. Durrance, J. L. Bertaux (Centre National de la Recherche Scientifique, Paris)07 (Institut d'Astrophysique, Paris), and M. C. Festou *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 500 refs (For primary document see N85-20961 11-89)
(Grant NsG-5393)
Avail: NTIS HC A23/MF A01 CSCL 03B

It is now possible to estimate the long term variation of the S(+), S(++), and (to a lesser extent) S(+++) concentrations in the high electron temperature core plasma of the Io torus. The effects of the viewing geometry and the rocking of the torus about the centrifugal axis were modeled using (1) the plasma density and electron temperature profiles previously derived from Voyager data by others; (2) the assumption that an ion mixing ratio was the same throughout the torus; and (3) local charge neutrality. This procedure was checked by using a crude spatial scan consisting of three five-hour observations obtained back to back at elongations of 5.0, 6.0, and 7.0 R sub J. The S(+), and S(++) and a smaller number of S(+++) concentrations are presented for thirteen observations from 1979 March 1 to 1984 March 21. Significant variations in the plasma density have clearly occurred. A.R.H.

N85-21071*# State Univ. of New York, Stony Brook. Dept. of Earth and Space Science.
ULTRAVIOLET OBSERVATIONS OF URANUS AND NEPTUNE BELOW 3000 A Abstract Only
John Caldwell, Richard Wagener, Tobias Owen, Michel Combes (Observatoire de Paris, France), and Therese Encrenaz (Observatoire de Paris, France) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 501 (For primary document see N85-20961 11-89)
(Grant NsG-5250)
Avail: NTIS HC A23/MF A01 CSCL 03A

From 2000 A to 3000 A, both Uranus and Neptune have albedos that are about two times higher than Jupiter or Saturn's, implying that the outer giants have stratospheres that are relatively free of aerosol absorption. Uncertainties in the absolute calibration procedure allow discrepancies of order 15% between conservative models and the observations. A small amount of aerosol absorption is therefore possible. Below 2000 A, the derived albedo is highly dependent on the solar spectrum source used in the data reduction. The most recent result for Uranus is consistent with a secular change in C2H2 mixing ratio from approximately 3 x (10 to the -8 power) in 1980 to < or = 10 to the -9 power in 1983. These values are approximately 2 orders of magnitude less than the mixing ratios of this gas on Saturn, and comparable to the amount on Jupiter. Author

N85-21072*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
IMPLICATIONS OF THE PRESENCE OF S2 IN COMETARY ICE
P. D. Feldman and M. F. AHearn (Maryland Univ.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 502-503 refs (For primary document see N85-20961 11-89)
(Grants NsG-5393; NAG5-279)
Avail: NTIS HC A23/MF A01 CSCL 03A

The discovery, by IUE, of the sulphur dimer, S2, in the near nucleus region of comet IRAS-Araki-Alcock provides studying cometary structure and evolution. Observations of S2 can be used to monitor short term fluctuations in cometary activity, and in fact the IUE observations showed a mark decrease in S2 surface brightness (a factor of 20) over a 32-hour period. The other ultraviolet emissions also decreased during this time but only by about a factor of 4. The ultraviolet data, coupled with the FES counts data, lead to a lower limit approximately 28 hours for the rotation period of the comet. This result is based on the assumption of a single localized region of volatile ices containing S2 on the surface of the cometary nucleus. The presences of S2 in the cometary ice also implies that significant irradiation of the cometary material must have occurred in its early evolutionary history. The possibility of strong irradiation of cometesimals during the pre-solar nebula phase in the interstellar medium is suggested. A.R.H.

N85-21073*# European Space Agency. ESA Tracking Station, Madrid (Spain). Astronomy Div.
IUE LOW-DISPERSION REFERENCE ATLAS
A. Heck, D. Egret (Observatoire de Strasbourg, France), M. Jaschek (Observatoire de Strasbourg, France), and C. Jaschek (Observatoire de Strasbourg, France) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 507-510 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

This atlas, published by ESA and essentially devoted to normal stars, presents 229 graphic spectra together with the corresponding fluxes and an ultraviolet spectral type. The preparation of this publication confirmed that MK classifications cannot simply be transferred to the ultraviolet range. A set of transparencies illustrates the reference sequences constructed from the ultraviolet data. A magnetic-tape copy of all the spectra pertaining to this atlas is available from the Stellar Data Center in Strasbourg. Author

N85-21074*# Space Telescope Science Inst., Baltimore, Md.
AN IUE HIGH-RESOLUTION ATLAS OF O-TYPE SPECTRA Abstract Only
Nolan R. Walborn, Robert J. Panek (Wellesley Coll., Mass.), and Joy N. Heckathorn (Computer Sciences Corp.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 511 (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

Statistical data analysis methods were applied to a set of stellar low-dispersion IUE spectra. From distances between flux vectors in an adequate multivariate space, these algorithms build statistical classification schemes in the UV which can be confronted to classical morphological approaches. A progress report of the study is given. Author

N85-21075*# Observatoire de Strasbourg (France).
STATISTICAL CLASSIFICATION OF IUE LOW-DESPERSION

STELLAR SPECTRA: PROGRESS REPORT

D. Egret, A. Heck, Ph. Nobelis (Centre d'Etudes Statistiques, Strasbourg, France), and J.-C. Turlot (Centre d'Etudes Statistiques, Strasbourg, France) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 512-515 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

The 1200A to 1900A region was surveyed in about high resolution IUE SWP data for about 120 0-types stars having homogeneous optical spectral classifications. Standard extacted spectrograms were rebinned to a constant wavelength resolution of 0.25A, uniformly nomalized (not dereddened), and then plotted at 10A/cm, with reseau, photometric quality, and echelle order junction flags available. This resolving power of 6000 at 1500A permits clear discrimination between stellar and interstellar features. Results show a high degree of correlation between the UV features, both photospheric and stellar-wind, and the optical spectral types/lumonosity classes for the majority of normal stars. A large-format spectra atlas, to be published by NASA, illustrating the full 1200A to 1900A range in about 100 of these objects is being prepared. The tracings will extend across two facing pages with four or five objects per montage, showing spectral-type and luminosity sequences as well as peculiar spectra. A.R.H.

N85-21076*# European Space Agency. ESA Tracking Station, Madrid (Spain).

IUE OBSERVATIONS OF FAINT STANDARD STARS FOR CALIBRATION OF THE SPACE TELESCOPE

A. W. Harris, C. Gry, P. Benvenuti, A. Cassatella, R. Gilmozzi, B. J. M. Hassall, A. Talavera, and W. Wamsteker *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 516-520 (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

Many scientific programs envisaged for the space telescope (ST) require spectrophotometric observations with precise determination of absolute flux as a function of wavelength. However, the accurate calibration of the ST instruments throughout the extremely broad (UV-IR) operational wavelength range presents a major challenge to the ST project. A program being carried out in collaboration with the ST calibration team, aims to provide accurate, absolute IUE spectrophotometric data for a number of faint standard stars with magnitudes near the limit of IUE's observing capability. The scope of the program and the precautions taken to maximize the accuracy of the IUE data are discussed. Author

N85-21077*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.

CALIBRATIONS OF WAVELENGTHS IN SWP ECHELLE SPECTRA

M. D. DeLaPana and T. R. Ayres *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 521-524 (For primary document see N85-20961 11-89)

(Grant NAG5-199)

Avail: NTIS HC A23/MF A01 CSCL 03A

Sources of random and systematic errors in the echelle wavelength scales that must be minimized in order to obtain high quality radial velocity measurements of emission lines in the far UV with IUE are reviewed. The problem of overexposure of the strongest Pt II emission lines at the long wavelength end of the spectrum and the faintness of the remaining Pt II emission features is also examined. Wavelength calibration spectra from IUE archives were analyzed using an interactive procedure incorporating a least squares Gaussian fitting algorithm. The standard deviation of the PHCAL wavecals (+/- 1.1 km/sec using 1982 data only) is less than was found for the 6 wavecals (+/- 3.1 km/sec) obtained on consecutive days in December of 1982 in a previous study nearly contemporaneous wavecals to register velocity scales of stellar high dispersion observations. The standard deviation of the mean residuals of the orders averaged over 1982 is 2.2 km/sec, which can be interpreted as the internal consistency of the IUE SW wavelength scales. A.R.H.

N85-21078*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IMPROVED CONTINUUM DEFINITION IN HIGH-BACKGROUND IUE IMAGES

Richard L. Hackney (Western Kentucky Univ.), Karen R. H. Hackney (Western Kentucky Univ.), and Yoji Kondo *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 525-528 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

A technique is described for automatically filtering low-dispersion IUE images of untrailed point sources during extraction from the guest observer tape, for the purpose of reducing the effects of radiation events and bright pixels and obtaining improved definition of the continuum in long duration or high-background exposures. The method is based upon fitting a gaussian point-spread-function (PSF) to crosscuts of the sample orders in ESSR or LBLS files, which can be processed on a relatively small computer. Several adjacent crosscuts are binned during the fit to permit discriminating against errant samples lying directly along the dispersion line (and narrow spectral lines). The procedure results in a significant reduction of discrepancies in the fitted power-law indices for repeated exposures of faint BL Lac objects, compared with the results of previously attempted automatic filtering techniques. Author

N85-21079*# California Univ., Berkeley. Space Sciences Lab.

A NEW GENERATION OF SPECTROMETER DESIGNS FOR ULTRAVIOLET ASTRONOMY Abstract Only

M. Hettrick and S. Bowyer *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 529 (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

In grazing incidence reflecting grating spectrometers, a plane grating (or combination or plane gratings) directly intercepts, diffracts and focuses at grazing incidence the light collected by a preceding mirror. The common feature of the resulting gratings is a smooth spatial variation in the grooves spacings. Some grooves diffract within the plane of incidence, and are spaced quadratically with the distance from focus; while other grooves diffract conically, and fan-out linearly with the distance from a ruling focus located behind the mirror focus. Several variants of these solutions are analyzed through both analytic calculations and raytraces, which describes the imaging properties. It is shown that the in-plane grating mount is required if resolutions in excess of approximately 1000 are needed. A grating having grooves concentric about a common line, is raytraced and delivers in the extreme UV a lambda/delta lambda approximately 10,000 over a few percent in wavelength. In combination with a conical fan low resolution cross-disperser, a two-element echelle spectrometer operates at several x 10 10,000 over a factor of two in wavelength simultaneously. A.R.H.

N85-21080*# Stanford Univ., Calif. Center for Space Science and Astrophysics.

THE MULTI-ANODE MICROCHANNEL ARRAY DETECTOR SYSTEM: CURRENT STATUS AND FUTURE PROSPECTS

J. Gethyn Timothy *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 530-533 refs (For primary document see N85-20961 11-89)

(Grants NAGw-551; NAG5-622)

Avail: NTIS HC A23/MF A01 CSCL 03A

the multi-anode microchannel arrays (MAMAs) are a family of photoelectric pulse-counting array detectors that are being developed specifically for use in space. MAMA detectors with formats as large as 256 x 1024 pixels are currently under evaluation in the laboratory, and a (24 x 1024)-pixel extreme-ultraviolet MAMA detector was recently flown successfully on a sounding rocket. A (256 x 1024)-pixel ultraviolet MAMA detector system is now being

prepared for flight on the balloon-borne ultraviolet stellar spectrograph (BUSS). The performance characteristics of this detector system are briefly described and the implications for the design of the detectors for the FUSE (now Columbus) mission are discussed. Author

N85-21081*# Naval Research Lab., Washington, D. C. Center for Space Research.

STELLAR ULTRAVIOLET FLUX DISTRIBUTIONS IN THE 912-1200 A WAVELENGTH RANGE

George R. Carruthers, Harry M. Heckathorn, and Chet B. Opal *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 534-540 refs (For primary document see N85-20961 11-89)

Avail: NTIS HC A23/MF A01 CSCL 03A

A series of three sounding rocket experiments was conducted to aimed measure stellar ultraviolet flux distributions in the wavelength range below 1200 A, the effective limit of previous calibrations such as those of OAO-2, TD-1, and IUE. Previous sounding rocket and Voyager UVS measurements in this wavelength range were discordant with each other and with model atmosphere predictions. The calibration and data reduction procedures used for our investigations, are described as well as preliminary results. Author

N85-21082*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

LSS 2018: A DOUBLE-LINED SPECTROSCOPIC BINARY CENTRAL STAR WITH AN EXTREMELY LARGE REFLECTION EFFECT

J. S. Drilling [1985] 17 p refs Prepared in cooperation with Kiel Univ., West Germany

(Grants NAG5-71; NSF AST-80-18766; NSF INT-82-19240)

(NASA-CR-175503; NAS 1.26:175503) Avail: NTIS HC A02/MF A01 CSCL 03A

LSS 2018, the central star of the planetry nebulae DS1, was found to be a double-lined spectroscopic binary with a period of 8.571 hours. Light variations with the same period were observed in U, B, and V; in the wavelength regions defined by the two IUE cameras; and in the strength of the CIII 4647 emission line. The light variations can be accurately predicted by a simple reflection effect, and an analysis of the light curves yields the angular diameter and effective temperature of the primary, the radii of the two stars in terms of their separation, and the inclination of the system. Analysis of the radial velocities then yields the masses of the two stars, their separation, the distance of the system, the absolute magnitude of the primary, and the size of the nebula. Author

N85-21083# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MEASUREMENT OF NUCLEAR LINES WITH A DUAL Ge(LI) TELESCOPE ABOARD A STRATOSPHERIC BALLOON M.S. Thesis [MEDIDAS DE LINHAS NUCLEARES COM UM TELESCOPIO Ge(LI) DUPLO A BORDO DE BALAO ESTRATOSFERICO]

Joao Braga Dec. 1984 78 p refs In PORTUGUESE; ENGLISH summary

(INPE-3380-TDL/185) Avail: NTIS HC A05/MF A01

A high energy resolution balloonborne gamma ray telescope, consisted of two Ge(Li) diodes and an active shield of NaI(Tl) scintillators, is described. The data obtained during both the laboratory calibration of the instrument and a stratospheric balloon flight are discussed. The advantages of the utilization of this telescope to detect cosmic nuclear lines, which are the most direct probe of high energy processes taking place in the Universe, are emphasized. E.A.K.

N85-21084# Georgia State Univ., Atlanta. Dept. of Physics and Astronomy.

IMAGE PROCESSING INSTRUMENTATION FOR SPECKLE INTERFEROMETRY AND IMAGING Final Technical Report, 1 Aug. 1983 - 30 Sep. 1984

H. A. McAlister 7 Nov. 1984 11 p Original contains color illustrations

(Grant AF-AFOSR-0257-83)

(AD-A149308; AFOSR-84-1172TR) Avail: NTIS HC A02/MF A01 CSCL 17/8

This final technical report describes the rationale for the acquisition of computer hardware for assembling an interactive image processing facility to be used for on-going programs of high angular resolution speckle interferometry of astronomical objects. Speckle interferometry is a technique for obtaining diffraction limited spatial information of distant objects through the turbulent atmosphere while simultaneously permitting differential positional measurements of very high accuracy. This method is being applied at Georgia State University in a program whose scientific goal is the detection of planetary mass companions in binary star systems. Funding from the DoD-University Research Instrumentation Program has permitted the acquisition of a dedicated digital image processing system to optimize the reduction and analysis of these data. The system components include a VAX 11/750 computer serving as host machine to an International Imaging Systems Model 70/F image processor with a variety of peripherals. The system is fully operational and extensive software development is underway. GRA

N85-21085# Stanford Linear Accelerator Center, Calif.

OLD AND NEW NEUTRON STARS

M. Ruderman (Columbia Univ., N.Y.) Sep. 1984 19 p refs Presented at the Cornell Symp. on New Directions in Astrophysics, Ithaca, N.Y., 3 Oct. 1984 Sponsored in part by NSF

(Contract DE-AC03-76SF-00515)

(DE85-0027216; SU-SLAC-PUB-3458; CONF-8410178-1) Avail: NTIS HC A02/MF A01

The youngest known radiopulsar in the rapidly spinning magnetized neutron star which powers the Crab Nebula is the remnant of the historical supernova explosion of 1054 AD. Similar neutron stars are probably born at least every few hundred years, but are less frequent than galactic supernova explosions. They are initially sources of extreme relativistic electric and/or positron winds (approx. 10(38)s of 10(12) eV leptons) which greatly decrease as the neutron stars spin down to become mature pulsars. After several million years there neutron stars are no longer observed as radiopulsars, perhaps because of large magnetic field decay. However, a substantial fraction of the isotropically distributed (GAMMA)-ray burst detected several times per week at the Earth. Some old neutron stars are spun up by accretion from companions to be resurrected as rapidly spinning low magnetic field radiopulsars. DOE

N85-21086# Max-Planck-Inst. fuer Radioastronomie, Bonn (West Germany).

OBSERVATIONS OF COMETS: RADIO AND OTHERWISE

M. K. Bird, ed. Aug. 1984 79 p refs Presented at a workshop held in Bonn, 4 Jun. 1984

(TB-64) Avail: NTIS HC A05/MF A01

Radio line observations of comets the radio continuum of comets IRAS observations of comets optical detection of cometary molecules comets in the UV theoretical aspects of cometary radio line excitation artificial stimulation of the OH maser in the comet Halley cometary radar and radio science and cometary occultation experiments were discussed. Author (ESA)

N85-21087# Royal Greenwich Observatory, Herstmonceux (England).

HERSTMONCEUX OBSERVATIONS OF THE SUN, PLANETS AND MOON, 1957 - 1982

R. H. D. Swifte, P. Gibbs, M. E. Buontempo, and Patricia Eldridge 1984 40 p refs Document includes a Microfiche supplement

(Bull-193; ISSN-0308-5074) Avail: NTIS HC A03/MF A01; Royal Greenwich Observatory, Herstmonceux, England £7

Observations made at Herstmonceux (England) with the Cooke Transit Circle from 1957 to 1982 are presented. The positions are based on the system of the FK4; the results extend and replace provisional positions previously published. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-21088*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
X-RAY EMISSION FROM ACTIVE GALACTIC NUCLEI
Richard Mushotzky Mar. 1985 23 p refs Presented at the X-Ray Astronomy '84 Meeting, Bologna and UV Emission from Active Galactic Nuclei Meeting, Munich, Jul. 1984
(NASA-TM-86175; Rept-85B0239; NAS 1.15:86175) Avail: NTIS HC A02/MF A01 CSCL 03B

It is often held that the X-ray emission from active galactic nuclei (AGN) arises from a region close to the central energy source. Thus X-ray observations may provide the best constraints on the central engine. In particular, the shape of the X-ray continuum gives information about the mechanism for photon generation, X-ray time variability data can constrain the size and mass of the continuum source, and X-ray occultation data give constraints on the relative sizes of the continuum source and the intervening absorbing material (often assumed to be the broad line clouds). In addition, since a fair fraction of the total energy of an AGN is emitted at X-ray wavelengths, direct measurement of the amount and spectral form of this radiation is important for modeling of the optically emitting clouds. Author

N85-21089*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE PHYSICAL IMPLICATIONS OF AN ISOTHERMAL MODEL FOR THE HOT INTRACLUSTER MEDIUM
Mark J. Hendriksen (Maryland Univ., College Park) and Richard Mushotzky Mar. 1985 26 p refs Submitted for publication
(NASA-TM-86174; Rept-85B0238; NAS 1.15:86174) Avail: NTIS HC A03/MF A01 CSCL 03B

X-ray fluxes from HEAO-1 A2 and Einstein Imaging Proportional Counter (IPC) observations of clusters of galaxies were used to constrain the parameter beta in the isothermal surface brightness profile. Beta is found primarily to have values between .50 and .75 for 15 clusters. Eight of these objects have values of beta previously measured using imaging observations. For these clusters good agreement is found with the values reported here implying that this profile is a good description of the surface brightness out to 8 to 10 core radii. The total gas mass and radial distribution (assuming spherical symmetry) within the cluster resulting from the isothermal model imply an extended halo of hot gas which has 30 to 60% of the virial mass for some clusters. B.W.

N85-21090*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONSEQUENCES OF HOT GAS IN THE BROAD LINE REGION OF ACTIVE GALACTIC NUCLEI
T. Kallman and R. Mushotzky Mar. 1985 38 p refs Submitted for publication
(NASA-TM-86176; Rept-85B0237; NAS 1.15:86176) Avail: NTIS HC A03/MF A01 CSCL 03B

Models for hot gas in the broad line region of active galactic nuclei are discussed. The results of the two phase equilibrium models for confinement of broad line clouds by Compton heated gas are used to show that high luminosity quasars are expected to show Fe XXVI L alpha line absorption which will be observed with spectrometers such as those planned for the future X-ray spectroscopy experiments. Two phase equilibrium models also predict that the gas in the broad line clouds and the confining medium may be Compton thick. It is shown that the combined effects of Comptonization and photoabsorption can suppress both the broad emission lines and X-rays in the Einstein and HEAO-1 energy bands. The observed properties of such Compton thick active galaxies are expected to be similar to those of Seyfert 2 nuclei. The implications for polarization and variability are also discussed. E.A.K.

N85-21091# Chicago Univ., Ill. Astronomy and Astrophysics Center.
DECAYING PARTICLES DO NOT HEAT UP THE UNIVERSE
R. J. Scherrer and M. S. Turner Sep. 1984 15 p refs Prepared in cooperation with Fermi National Accelerator Lab., Batavia, Ill.
(Contract DE-AC02-76CH-03000)
(DE85-002191; FERMILAB-Pub-84/94) Avail: NTIS HC A02/MF A01

It is usually assumed that a massive relic species, which comes to dominate the mass density of the Universe and later decays, heats up the Universe when the age of the Universe approx. = its lifetime. It is shown that if its decay follows the usual exponential decay law, then the Universe is never reheated, rather it just cools more slowly. The evolution of the temperature and entropy are calculated. To within numerical factors of order unity, the usual estimates for the entropy increase are found to be correct. Results have implications for primordial nucleosynthesis in scenarios where a massive relic with lifetime approx. = 0.01 to 0.001 sec is present, and for baryogenesis in the new inflationary Universe scenario. DOE

N85-21092# California Univ., Livermore. Lawrence Livermore Lab.
LARGE NATURAL GEOPHYSICAL EVENTS: PLANETARY PLANNING
J. B. Knox and J. V. Smith (Chicago, Univ.) Sep. 1984 34 p refs Presented at the 4th Intern. Conf. on Nucl. War, Erice, Italy, 19 Aug. 1984
(Contract W-7405-eng-48)
(DE85-000859; UCRL-91356; CONF-8408122-1) Avail: NTIS HC A03/MF A01

Geological and geophysical data suggest that during the evolution of the Earth and its species, that there have been many mass extinctions due to large impacts from comets and large asteroids, and major volcanic events. With current technology, protective measures for the planet can be considered. Evidence of the ecological disruption and frequency of these major events is presented. Surveillance and warning systems are most critical to develop wherein sufficient lead times for warnings exist so that appropriate interventions could be designed. The long term research undergirding these warning systems, implementation, and proof testing is rich in opportunities for collaboration for peace. Author

N85-21093# California Univ., Livermore. Lawrence Radiation Lab.
SHELL-MODEL LANCZOS-METHOD STUDIES OF THE GAMOW-TELLER STRENGTH FUNCTION IN ASTROPHYSICS
G. J. Mathews, S. D. Bloom, K. Takahashi, G. M. Fuller, and R. F. Hausman, Jr. Nov. 1984 13 p refs Presented at Intern. Symp. on Nucl. Shell Model, Philadelphia, Pa., 31 Oct. 1984 Prepared in cooperation with Los Alamos Scientific Lab., N. Mex.
(Contract W-7405-eng-48)
(DE85-004205; UCRL-91788; CONF-8410144-3) Avail: NTIS HC A02/MF A01

The Livermore system of vectorized shell model codes is used to study the Gamow-Teller strength functions for a variety of nuclei whose weak interaction properties are of interest in astrophysics. The Lanczos method is used to diagonalize a model space consisting of low seniority excitations (including all states directly populated by the Gamow-Teller operator) with a realistic finite range effective interaction. The effects of model space truncation are systematically investigated for each nucleus. The results of these calculations are discussed in connection with problems in stellar evolution, supernova collapse, and nucleosynthesis. DOE

N85-21094# Stanford Linear Accelerator Center, Calif. Dept. of Physics.
AXIONS IN ASTROPHYSICS AND COSMOLOGY
P. Sikivie Jul. 1984 13 p refs Presented at Inner Space/Outer Space Conf., Batavia, Ill., 2 May 1984
(Contract DE85-AC03-76SF-00515)
(DE85-002720; SU-SLAC-PUB-3373; CONF-8405155-5) Avail:

NTIS HC A02/MF A01

Axion models often have a spontaneously broken exact discrete symmetry. In that case, they have discretely degenerate vacua and hence domain walls. The properties of the domain walls, the cosmological catastrophe they produce, and the ways in which this catastrophe may be avoided are explained. Cosmology and astrophysics provide arguments that imply the axion decay constant should lie in the range 10 to the 8th power GeV less than or equal to f sub a less than or equal to 10 to the 12th power GeV. Reasons are given why axions are an excellent candidate to constitute the dark matter of galactic halos. Using the coupling of the axions to the electromagnetic field, detectors are described to look for axions floating about in the halo of our galaxy and for axions emitted by the Sun. DOE

N85-21095*# Fermi National Accelerator Lab., Batavia, Ill.
RECENT HEAVY PARTICLE DECAY IN A MATTER DOMINATED UNIVERSE
Keith A. Olive, David Seckel, and Ethan Vishniac (Texas Univ., Austin) Sep. 1984 20 p refs
(Contract DE-AC02-76OR-03000)
(NASA-CR-175501; NAS 1.26:175501; DE85-002192; Fermilab-Pub-84/86-A) Avail: NTIS HC A02/MF A01 CSCL 03B

The cold matter scenario for galaxy formation solves the dark matter problem very nicely on small scales corresponding to galaxies and clusters of galaxies. It is, however, difficult to reconcile with a Universe with an Einstein-deSitter value of (UC OMEGA) = 1. Cold matter and (UC OMEGA) = 1 can be made compatible while retaining the feature that the Universe is matter dominated today. This is done by means of heavy (cold) particles whose decay subsequently leads to the unbinding of a large fraction of lighter clustered matter. DOE

N85-20973*# Rice Univ., Houston, Tex.
COMMENTS ON THE ORIGINS AND VARIATIONS OF CARBON AND NITROGEN IN THE ISM OF GALAXIES AS EVIDENT FROM IUE SPECTROSCOPY OF H 2 REGIONS
Reginald J. Dufour *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 107-110 refs Prepared in cooperation with Dominion Astrophysical Observatory, Victoria, British Columbia (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-20976*# Wisconsin Univ., Madison. Washburn Observatory.
HIGHLY IONIZED GAS ASSOCIATED WITH THE SMALL MAGELLANIC CLOUD
Edward L. Fitzpatrick and Blair D. Savage *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 119-122 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-20999*# Colorado Univ., Boulder.
HIGH-VELOCITY INTERSTELLAR GAS IN THE LINE-OF-SIGHT TO HD 50896
Joy N. Heckathorn (Computer Sciences Corp.) and Robert A. Fesen *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 207-210 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21000*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE VARIATION OF GALACTIC INTERSTELLAR EXTENCTION IN THE ULTRAVIOLET Abstract Only
A. N. Witt (Toledo Univ., Ohio), R. C. Bohlin (Space Telescope Science Inst.), and T. P. Stecher *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 211 Submitted for publication (For primary document see N85-20961 11-89)
(Grants NAG5-167; NAGw-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21001*# Osservatorio Astronomico, Trieste (Italy).
INTERSTELLAR EXTINCTION IN THE NUCLEUS OF H PER Abstract Only
A. Magazzu (SISSA-ISAS, Trieste) and R. Stalio (National Solar Observatory, Tucson, Ariz.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Year of IUE Res. Dec. 1984 p 212 Submitted for publication (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21002*# Delaware Univ., Newark.
CORONAL EFFECTS OF THE WINDS OF EARLY-TYPE STARS
Wayne L. Waldron *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 215-218 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21003*# University of Western Ontario, London. Dept. of Astronomy.
SUPERIONIZED SPECIES AND WINDS IN LOW LUMINOSITY B AND Be STARS
Paul K. Barker, J. M. Marlborough, and J. D. Landstreet *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 219-222 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21004*# Washington Univ., Seattle.
STELLAR WINDS IN THE YOUNG GALACTIC CLUSTER NGC 6530
Erika Bohm-Vitense and Paul Hodge *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 223-226 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21005*# Wisconsin Univ., Madison. Washburn Observatory.
MAIN SEQUENCE B STARS WITH STRONG WINDS
D. Massa and B. D. Savage *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 227-230 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21014*# Catholic Univ. of America, Washington, D.C. Dept. of Physics.
FURTHER INVESTIGATION OF MASS LOSS PHENOMENA IN HOT WHITE DWARFS AND O SUBDWARFS
Frederick C. Bruhweiler *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 269-272 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03A

N85-21021*# Washington Univ., Seattle. Dept. of Astronomy.
THE OUTBURST AND LONG TERM BEHAVIOR OF THE TRIPLE PERIOD CATACLYSMIC VARIABLE TV COL
Paula Szkody and Mario Mateo *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 297-300 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21025*# Arizona State Univ., Tempe. Dept. of Physics.
HYDRODYNAMIC SIMULATIONS OF RECURRENT NOVAE
Sumner Starrfield, Warren M. Sparks (Los Alamos National Lab.), James W. Truran (Illinois Univ.), and Edward M. Sion *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 313-317 refs

Sponsored in part by DOE (For primary document see N85-20961 11-89)
(Grants NSF AST-81-17177; NSF AST-83-14788; NSF AST-83-14415)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21040*# Toledo Univ., Ohio. Astrophysical Research Center.
THE STELLAR WIND IN THE BO V-TYPE ECLIPSING BINARY Y CYGNI
N. D. Morrison and C. D. Garmany (Joint Inst. for Lab. Astrophysics) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 373-376 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21044*# National Central Univ., Chung-Li (Taiwan). Inst. of Physics and Astronomy.
THE ESSENCE OF BINARY STAR COALESCENCE: A COORDINATED GROUND-BASED PHOTOMETRIC AND IUE ULTRAVIOLET STUDY OF FK COMAE
J. D. Dorren and E. F. Guinan (Villanova Univ., Pa.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 391-395 refs (For primary document see N85-20961 11-89)
(Grant NAG5-382)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21045*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRANGE F + Be BINARY STAR SYSTEMS
Sidney B. Parsons (Computer Sciences Corp.), Bernard W. Bopp (Toledo Univ., Ohio), and Yoji Kondo *In its* Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 396-399 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21055*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary, and Atmospheric Sciences.
THE SOLAR-STELLAR CONNECTION IN THE FAR ULTRAVIOLET
J. O. Bennett, T. R. Ayres, and G. J. Rottman *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 437-440 (For primary document see N85-20961 11-89)
(Grant NAG5-199)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21066*# Washington Univ., Seattle. Dept. of Astronomy.
MAGNETOSPHERES AND WINDS IN THE HELIUM WEAK STARS: OBSERVATIONS OF C 5 IN UPPER MAIN SEQUENCE CP STARS
Douglas N. Brown, Steven N. Shore (Case Western Reserve Univ., Cleveland, Ohio), Paul K. Barker (Univ. of Western Ontario, London), and George Sonneborn (Computer Sciences Corp., Greenbelt, Md.) *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 487-490 refs (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N85-21096 Institut d'Aeronomie Spatiale de Belgique, Brussels.
A NEW LOOK AT THE PLANETS [UN NOUVEAU REGARD SUR LES PLANETES]
E. Aerts 1984 89 p In FRENCH; ENGLISH summary
(Aeronomica-Acta-37-1984) Avail: Issuing Activity

Results of observation of the planets and their moons by space probes are reviewed. Meteorological, geological, aeronomical, magnetic, and atmospheric data are discussed. Launch dates, orbits, and mission objectives of the probes are listed.
Author (ESA)

N85-21097*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
COMETARY ATMOSPHERES: MODELING THE SPATIAL DISTRIBUTION OF OBSERVED NEUTRAL RADICALS Interim Report, 1 Jun. 1984 - 31 Aug. 1984
Michael R. Combi Oct. 1984 4 p refs
(Contract NASw-3950)
(NASA-CR-175491; NAS 1.26:175491) Avail: NTIS HC A02/MF A01 CSCL 03B

The Monte Carlo particle trajectory model for the saptial distribution of cometary radicals was modified to include the heliocentric distance dependence of the parent molecule velocity, and the heliocentric velocity dependence for CN fluorescence and radiation pressure. Available data on the observed spatial distributions of cometary radicals were studied and a preliminary comparison of newly published data from previous studies is discussed.
E.A.K.

N85-21098*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
COMETARY ATMOSPHERES: MODELING THE SPATIAL DISTRIBUTION OF OBSERVED NEUTRAL RADICALS Interim Report, Dec. 1984 - Feb. 1985
Michael R. Combi Feb. 1985 8 p refs
(Contract NASw-3950)
(NASA-CR-175485; NAS 1.26:175485) Avail: NTIS HC A02/MF A01 CSCL 03B

An algorithm for the random walk problem of multiple elastic collisions between newly formed non-thermal neutral cometary radicals and the outflowing cometary molecules was incorporated into the Monte Carlo particle-trajectory model. Preliminary model analysis has shown that the effects of collision on the observed spatial distribution of cometary radicals becomes important for the larger bright comets, especially at smaller values of the helicocentric distance. The model and early results are discussed herein.
Author

N85-21099*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONCLUSION OF VIKING LANDER IMAGING INVESTIGATION: PICTURE CATALOG OF EXPERIMENT DATA RECORD
Stephen D. Wall and Teresa C. Ashmore Mar. 1985 175 p refs
(NASA-RP-1137; L-15925; NAS 1.61:1137) Avail: NTIS HC A04/MF A01 CSCL 03B

The images returned by the two Viking landers during the Viking Survey Mission are presented in this report. Listing of supplemental information which describe the conditions under which the images were acquired are included. Subsets of the images are listed in a variety of sequences to aid in locating images of interest. The format and organization of the digital magnetic tape storage of the images are described. A brief description of the mission and the camera system is also included.
Author

N85-20431*# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
INTERACTION OF LARGE METEOROIDS WITH THE ATMOSPHERE
Z. Ceplecha *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 153-154 refs (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

N85-20432*# Kharkovskii Inst. Radioelektroniki (USSR).
THE GLOBAL METEOR OBSERVATION SYSTEM (GLOBMET)
B. L. Kashcheev *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 4 Apr. 1982 p 155-160 (For primary document see N85-20420 11-42)
Avail: NTIS HC A10/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

N85-20438*# Georgia Inst. of Tech., Atlanta.
GLOBAL METEOR OBSERVATION SYSTEM (GLOBMET)
Robert G. Roper *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 7 Dec. 1982 p 21-33 (For primary document see N85-20437 11-42)
Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

N85-21068*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
THE SPATIAL DEPENDENCE OF THE JOVIAN AURORAL EMISSIONS
T. E. Skinner, H. W. Moos, and G. E. Ballester *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 497-498 refs (For primary document see N85-20961 11-89)
(Grant NsG-5393)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21069*# State Univ. of New York, Stony Brook. Dept. of Earth and Space Science.
THE JOVIAN STRATOSPHERE IN THE ULTRAVIOLET Abstract Only
Richard Wagener and John Caldwell *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 129-132 (For primary document see N85-20961 11-89)
Avail: NTIS HC A23/MF A01 CSCL 03B

N85-21070*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
LONG TERM VARIABILITY OF THE IO TORUS Abstract Only
H. W. Moos, T. E. Skinner, P. D. Feldman, S. T. Durrance, J. L. Bertaux (Centre National de la Recherche Scientifique, Paris)07 (Institut d'Astrophysique, Paris), and M. C. Festou *In* NASA. Goddard Space Flight Center Future of Ultraviolet Astronomy Based on Six Years of IUE Res. Dec. 1984 p 500 refs (For primary document see N85-20961 11-89)
(Grant NsG-5393)
Avail: NTIS HC A23/MF A01 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-21100# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA. PART 1: (PROMPT REPORTS)
Helen E. Coffey, ed. Aug. 1984 113 p 2 Vol.
(PB85-112068; LC-79-640375; ISSN-0038-0911; SGD-480) Avail: NTIS HC A06/MF A01 CSCL 03B

A detailed index of solar-geophysical information was compiled, included were: data for July 1984--(IUWDS alert periods (advance and worldwide), solar activity indices, solar flares, solar radio emission, mean solar magnetic field, Boulder geomagnetic substorm log); data for June 1984--(solar active regions, sudden ionospheric disturbances, solar radio spectral observations, cosmic ray measurements by neutron monitor, geomagnetic indices, radio propagation indices), and late data--(geomagnetic indices May 1984, Pioneer 12 interplanetary magnetic field magnitudes, cosmic ray measurements by neutron monitor). GRA

N85-21101# Los Alamos Scientific Lab., N. Mex.
GLOBAL ASPECTS OF STREAM EVOLUTION IN THE SOLAR WIND
J. T. Gosling 1984 34 p refs Presented at Am. Inst. of Phys. Conf., Taos, N. Mex., 6 Aug. 1984
(Contract W-7405-eng-36)
(DE85-002207; LA-UR-84-3230) Avail: NTIS HC A03/MF A01

A spatially variable coronal expansion, when coupled with solar rotation, leads to the formation of high speed solar wind streams which evolve considerably with increasing heliocentric distance. Initially the streams steepen for simple kinematic reasons, but this steepening is resisted by pressure forces, leading eventually to the formation of forward-reverse shock pairs in the distant heliosphere. The basic physical processes responsible for stream steepening an evolution are explored and model calculations are compared with actual spacecraft observations of the process. The solar wind stream evolution problem is relatively well understood both observationally and theoretically. Tools developed in achieving this understanding should be applicable to other astrophysical systems where a spatially or temporally variable outflow is associated with a rotating object. DOE

N85-20448*# Institut d'Aeronomie Spatiale de Belgique, Brussels.
REPORT ON THE WORKSHOP ON INTERCOMPARISON OF SOLAR UV IRRADIANCE MEASUREMENTS AND RELATED INSTRUMENT CALIBRATION
P. C. Simon *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 8 Jul. 1983 p 45-51 ref (For primary document see N85-20445 11-42)
Avail: NTIS HC A05/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

N85-20455*# Ceskoslovenska Akademie Ved, Prague. Geophysical Inst.
IONOSPHERIC ABSORPTION ON 1539 kHz IN RELATION TO SOLAR IONIZING RADIATION
J. Boska *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 31-33 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

N85-20486*# Ceskoslovenska Akademie Ved, Prague. Geophysical Inst.
SOLAR FLARE AND IMF SECTOR STRUCTURE EFFECTS IN THE LOWER IONOSPHERE
J. Lastovicka *In* International Council of Scientific Unions Middle Atmosphere Program. Handbook for MAP, Vol. 10 May 1984 p 193-199 refs (For primary document see N85-20450 11-42)
Avail: NTIS HC A11/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

No abstracts in this category.

99 GENERAL

N85-21102*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JPL HIGHLIGHTS
1984 86 p Original contains color illustrations
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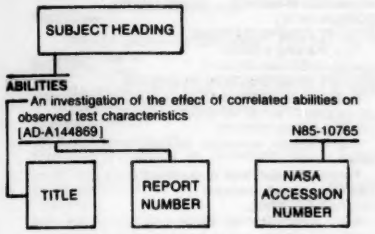
Deep-space exploration; information systems and space technology development; technology applications; energy and energy conversion technology; and earth observational systems and orbital applications are discussed. B.G.

Typical Subject Index Listing



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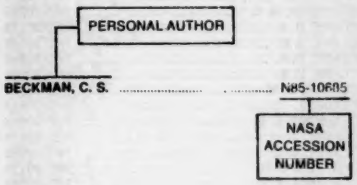

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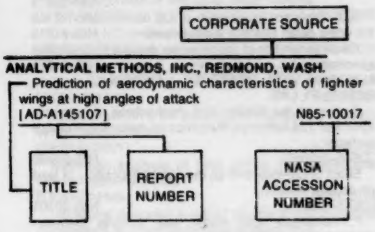

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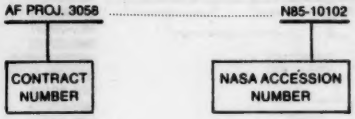

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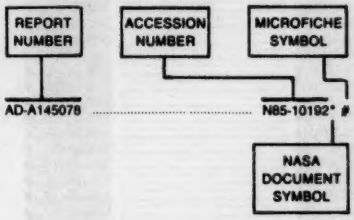

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NAS 1.71:LAR-13134-1 ..... N85-19980* #
NAS 1.71:LAR-13151-1 ..... N85-20247* #
NAS 1.71:LAR-13173-1 ..... N85-19981* #
NAS 1.71:LAR-13254-1 ..... N85-20154* #
NAS 1.71:LAR-13342-1 ..... N85-20297* #
NAS 1.71:LAR-13363-1 ..... N85-20128* #
NAS 1.71:LEW-13414-1 ..... N85-20530*
NAS 1.71:LEW-13837-3 ..... N85-20155* #
NAS 1.71:LEW-13935-1 ..... N85-20248* #
NAS 1.71:LEW-14072-1 ..... N85-20129* #
NAS 1.71:LEW-14080-1 ..... N85-20153*
NAS 1.71:LEW-14130-1 ..... N85-20156* #
NAS 1.71:LEW-14170-1 ..... N85-20377* #
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NAS 1.71:MFG-25969-1 ..... N85-20008* #
NAS 1.71:MFS-25825-1 ..... N85-20296* #
NAS 1.71:MFS-25862-1 ..... N85-20126*
NAS 1.71:MFS-25964-1 ..... N85-20378* #
NAS 1.71:MFS-25981-1 ..... N85-20299* #
NAS 1.71:MFS-26011-1SB ..... N85-20639* #
NAS 1.71:MFS-26008-1 ..... N85-20300* #
NAS 1.71:MSC-20112-1 ..... N85-20338*
NAS 1.71:MSC-20187-1 ..... N85-20249* #
NAS 1.71:MSC-20653-1 ..... N85-20301* #
NAS 1.71:NPO-15962-1 ..... N85-20650* #
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NASA-CASE-ARC-11547-1 ..... N85-20320* #
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NASA-CASE-GSC-12582-2 ..... N85-20337*
NASA-CASE-GSC-12789-1 ..... N85-20294*
NASA-CASE-GSC-12825-1 ..... N85-20668* #
NASA-CASE-GSC-12892-1 ..... N85-20226* #

NASA-CASE-KSC-11218-1 ..... N85-19990*

NASA-CASE-LAR-12723-1 ..... N85-20123*
NASA-CASE-LAR-12787-2 ..... N85-19985*
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NASA-CASE-LAR-12894-1 ..... N85-20125*
NASA-CASE-LAR-13065-1 ..... N85-20295*
NASA-CASE-LAR-13134-1 ..... N85-19980* #
NASA-CASE-LAR-13151-1 ..... N85-20247* #
NASA-CASE-LAR-13173-1 ..... N85-19981* #
NASA-CASE-LAR-13254-1 ..... N85-20154* #
NASA-CASE-LAR-13342-1 ..... N85-20297* #
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NASA-CASE-LEW-13414-1 ..... N85-20530*
NASA-CASE-LEW-13837-3 ..... N85-20155* #
NASA-CASE-LEW-13935-1 ..... N85-20248* #
NASA-CASE-LEW-14072-1 ..... N85-20129* #
NASA-CASE-LEW-14080-1 ..... N85-20153*
NASA-CASE-LEW-14130-1 ..... N85-20156* #
NASA-CASE-LEW-14170-1 ..... N85-20377* #
NASA-CASE-LEW-14177-1 ..... N85-20535* #

NASA-CASE-MFG-25969-1 ..... N85-20008* #

NASA-CASE-MFS-25825-1 ..... N85-20296* #
NASA-CASE-MFS-25862-1 ..... N85-20126*
NASA-CASE-MFS-25964-1 ..... N85-20378* #
NASA-CASE-MFS-25981-1 ..... N85-20299* #
NASA-CASE-MFS-26011-1SB ..... N85-20639* #
NASA-CASE-MFS-26008-1 ..... N85-20300* #

NASA-CASE-MSC-20112-1 ..... N85-20338*
NASA-CASE-MSC-20187-1 ..... N85-20249* #
NASA-CASE-MSC-20653-1 ..... N85-20301* #

NASA-CASE-NPO-15962-1 ..... N85-20650* #
NASA-CASE-NPO-16299-1 ..... N85-20250* #
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NASA-RP-1137 ..... N85-21099* #

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NASA-TM-77789 ..... N85-20245* #
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NASA-TM-77818 ..... N85-20905* #
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NASA-TM-86175 ..... N85-21088* #
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NASA-TM-86674 ..... N85-19924* #
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NASA-TP-2362 ..... N85-19925* #

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NASA-TP-2421 ..... N85-20396* #
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NBSIR-84-2906 ..... N85-20273 #
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NBSIR-84-2916 ..... N85-20674 #
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NOAA-TM-ERL-WPL-119 ..... N85-20238 #

NOAA-TM-NWS-WR-183 ..... N85-20614 #
NOAA-TM-NWS-WR-185 ..... N85-20613 #
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NTIA/REPT-84/159 ..... N85-20242 #
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OIT/FSTC-84/503 ..... N85-20720 #
OIT/FSTC-84/504 ..... N85-20719 #
OIT/FSTC-84/506 ..... N85-20717 #
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